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Previous **EDP/IR** indexes:
Volume 1 — March 23, 1964 to January 15, 1966
Volume 2 — March 15, 1966 to June 15, 1967
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Volume 4 — July 31, 1968 to August 29, 1969
Volume 5 — September 11, 1969 to December 9, 1970
Volume 6 — December 15, 1970 to October 19, 1971

VOLUME 7 HIGHLIGHTS

Issue No.	Date	Major Subject(s)
1	11/21/71	New products; CDC STAR; Hewlett-Packard; Honeywell Series 6000
2	11/30/71	Univac takes over RCA base; survey of FJCC exhibitors; AFIPS/Time survey
3	12/17/71	International review
4	12/24/71	Computer industry developments (Question and answer survey); 3 major cases against IBM
5	12/31/71	1971 worldwide shipments; computers in use by federal government
6	1/17/72	Toward distributed computing; IBM reorganization
7	2/8/72	CDC/NCR joint venture; Honeywell Series 2000
8	2/22/72	IBM discontinues maintenance on altered CPU's; Itel/AMS suit
9	3/3/72	ARPA network; computer concentration at large sites; IBM 3705
10	3/30/72	REVIEW AND FORECAST
11	4/11/72	370 emulator; Memorex MRX/40; IBM AMS/Itel settlement; IBM System/7 offerings
12	4/21/72	Customer loyalty study
13	4/28/72	IBM 360/20 repackaged; Worldwide installed base 1/1/72
14	5/19/72	SJCC; banks and computers
15	6/16/72	Burroughs B1700 series
16	6/30/72	Management attitude study; how EDP dollar is spent
17	7/13/72	Ruling against Greyhound in suit against IBM
18	7/27/72	Federal government market
19	8/15/72	IBM virtual storage
20	8/28/72	Computer leasing industry; independent maintenance
21	9/15/72	Computer services
22	9/25/72	ADAPSO survey on computer services
23	10/26/72	IBM 370/125; Justice Dept. asks IBM breakup
24	11/6/72	Point-of-sale terminals; GE, Tymshare broaden services

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	Issue	Page
ACM		
Discusses IBM's role	23	6
ADAPSO		
Survey of computer services	22	4
AEG-TELEFUNKEN		
Installed outside the U.S. 12/31/71	3	5
Teams up with Nixdorf	3	1
ARPA (Advanced Research Projects Agency)		
DOD agency links 20 computers	1	3
Concept of resource sharing (ARPANET)	9	1
Network maps	9	2, 3
ADVANCED DIGITAL SYSTEMS INC.		
Stock registration	13	8
ADVANCED MEMORY SYSTEMS INC.		
Files suit against IBM	8	1
Market memory boxes through Itel	8	1
Suit settled	11	4
AIRLINE RESERVATIONS		
Potential help through ARPANET	9	5
ANAREN MICROWAVE INC.		
Stock registration	8	8
ANNUAL STOCK MARKET SUMMARY	11	8
AUTOMATIC DATA PROCESSING INC.		
Stock registration	5	8
AUTREX INC.		
Stock registration	6	8
BEMA		
Position paper on foreign trade	8	5
BANKS		
Bank computer services operations Table	22	2
Bank computer services revenues Table	22	3
Burroughs banking systems in UK	3	7
Trends in services offerings	14	7
BURROUGHS CORP.		
Banking systems in UK	3	7
Customer loyalty study	12	
Review and forecast	10	7
B1700	15	1
B1700 vs. IBM System/3	15	5
1971 shipments	5	2
CRT'S		
Growth by 1975	6	4
CALIFORNIA COMPUTER PRODUCTS INC.		
Stock registration	5	8
Stock registration	16	8

	Issue	Page
CAMBRIDGE MEMORIES INC.		
Stock registration	16	8
$2 M contracts from Army and Navy	11	6
CAR/PUTER INTERNATIONAL CORP.		
Stock registration	8	8
CENSUS OF COMPUTERS		
Dedicated application digital computers		
As of 1/1/72	10	14
As of 7/1/72	24	6
General purpose computers		
As of 9/1/71	1	6
As of 1/1/72	10	12
As of 4/1/72	15	6
As of 7/1/72	22	6
CODEX CORP.		
Stock registration	18	8
COGAR CORP.		
Stock registration	5	8
COLMAR SYSTEMS INC.		
SEE CREDIT SYSTEMS INC.		
COMMA CORP.		
Independent maintenance	20	7
COMMERCIAL CREDIT CO.		
Stock registration	6	8
COMMUNICATIONS		
ARPANET	9	1-6
Growth in 1972	2	5
COMMUNIST COUNTRIES		
Market for U.S. computers	3	7
COMPAGNIE INTERNATIONALE POUR L'INFORMATIQUE (CII)		
Joint venture with CDC	3	1
COMPUCARE INC.		
Stock registration	14	8
COMPUMATRICS INTERNATIONAL MANAGEMENT CORP.		
Stock Registration	5	8
COMPUTER AUTOMATION INC.		
Stock registration	1	8
COMPUTER CONSULTANTS INC.		
Stock registration	8	8
Stock registration	18	8
COMPUTER DIMENSIONS INC.		
Stock registration	18	8
COMPUTER HARDWARE CONSULTANTS & SERVICES INC.		
Stock registration	14	8

	Issue	Page
COMPUTER HORIZONS		
Stock registration	1	8
COMPUTER INDUSTRY		
Customer loyalty study	12	1-8
Management attitude	16	1-7
Preliminary estimates 1971	4	1-6
Review and Forecast	10	1-10
SEE ALSO International market		
Market segments, e.g. software, services		
COMPUTER INVESTORS GROUP		
Markets Data Recall memory extensions	8	1
Preliminary settlement of suit	11	5
COMPUTER OPERATIONS INC.		
Stock registration	16	8
COMPUTER SCIENCES CORP.		
Independent maintenance & facilities management	20	7
COMPUTER SYSTEM ARCHITECTS		
Assesses "the new 370"	19	7
COMPUTER USERS		
Computer concentration in the U.S.	16	3
How the EDP dollar is spent	16	5
Spending by EDP activity	16	7
Customer loyalty study	12	1-8
COMPUTERIZED AUTOMOTIVE REPORTING SERVICE INC.		
Earnings reported	21	8
COMTEN INC.		
Stock registration	6	8
CONTROL DATA CORP.		
CDC vs. IBM	4	7
Customer loyalty study	12	
Cybernet centers	7	4
European activity	3	7
NCR joint venture	7	1
Review and forecase	10	7
STAR-100 order from General Motors	1	1
Syntonic Technology to be acquired	20	7
1971 shipments	5	2
CORNING GLASS WORKS		
Why the 904 failed	6	2
CREDIT SYSTEMS INC.		
Stock registration	13	8
CUSTOMER LOYALTY STUDY	12	1-8
DCS COMPUTER SERVICES INC.		
Stock registration	13	8
DPF CORP.		
Leasing plans	20	6
DATA DIMENSIONS INC.		
Stock registration	13	8
DATA DISC INC.		
Stock registration	18	8
DATA ENTRY MARKET		
1972 figures	2	5
DATA GENERAL CORP.		
Stock registration	6	8
DATA 100 CORP.		
Stock registration	16	8
DATA RECALL		
IBM reacts to memory extensions	8	1
Preliminary settlement of suit	11	5
Stock registration	11	7
DATAMAC INC.		
Stock registration	5	8
DATUM INC.		
Stock registration	13	8
DECIMUS CORP.		
370 Leasing	20	6
DECISION DATA COMPUTER CORP.		
Stock registration	8	8
DIEBOLD		
370 leasing	20	6
DIGI-LOG SYSTEMS INC.		
Stock registration	6	8
DIGITAL EQUIPMENT CORP.		
Installed outside the U.S.	3	5
Review and forecast	10	7
1971 shipments	5	2
DISTRIBUTED COMPUTING		
Continuing trend discussed	6	1
DORSET COMPUTYPE CORP.		
Stock registration	14	8
ENHANCED EDITING TERMINALS		
Big part of CRT base	6	4
FJCC		
Survey of exhibitors	3	3
FACILITIES MANAGEMENT		
Computer Sciences Corp.	20	7
Management attitude toward	16	4

	Issue	Page
FEDERAL GOVERNMENT		
Computers in use as of 6/30/71	5	7
Inventory by manufacturer as of 6/30/71	18	2
Recent procurements	18	4
Uncle Sam and the peripherals manufacturers	18	6
360's installed as of 6/30/71	18	3
SEE ALSO ARPA		
FIRST NATIONAL BANK OF BOSTON		
370 leases	20	6
FORECAST		
Computer services to 1975	21	1
Point-of-sale terminals	24	2
REVIEW AND FORECAST	10	1-11
FOREIGN TRADE		
Computer industry involvement	8	5
Trends and projections 1963-70	8	6
GE INFORMATION SERVICES		
Business Division broadens services	24	5
GTE INFORMATION SYSTEMS		
Independent computer maintenance	20	8
GENERAL AUTOMATION INC.		
Stock registration	1	8
GERMANY		
Nixdorf and AEG-Telefunken team up	3	1
GREYHOUND COMPUTER CORP.		
IBM suit	4	7
Leasing activity	20	6
HEWLETT-PACKARD		
S/3000 introduced	1	4
HONEYWELL FINANCE INC.		
Stock registration	1	8
HONEYWELL INFORMATION SYSTEMS		
Customer loyalty study	12	
European activities	3	7
Installed base at year-end 1971	7	7
Edward C. Lund comments on GE merger	7	6
New peripherals	7	8
RCA/Univac compared to Honeywell/GE	2	2
Review and forecast	10	5
Series 2000 announced	7	6
Stock registration	18	8
H/6000 first year sales	1	2, 5
INDECON INC.		
Stock registration	8	8
INTEL CORP.		
Stock registration	14	8
INTERNATIONAL BUSINESS MACHINES CORP. (IBM)		
ACM discusses IBM's role	23	7
Cost of 3330 acquisition	19	5
Customer loyalty study	12	2, 5
Discontinues maintenance on altered CPU's	8	1
Distribution in U.S.	15	8
EDP/IR attitude toward break-up	8	7
European activities	3	7
Greyhound ruled against in IBM suit	17	1
High rate of discontinuances	4	3
IBM and the Justice Dept.	23	4, 6
Installed base mid-1972	23	3
Introduces competitive emulators	11	1
Leasing of 370's	20	1
Main memory and CPU availability 360 & 370	19	3
Realigns DP Product Group	22	8
Realigns U.S. computer operations	6	6
Review and forecast	10	2, 3
Review of memories offered	8	3
Shipments 1971	5	2
Suit by Itel/AMS settled	11	4
System/3 challenged by B1700	15	5
System/7 offerings	11	6
Three major cases against IBM	4	6
Virtual storage	19	1
360/20 repackaged	13	1
370/125 unveiled	23	1
2922 prices	13	3
3705 introduced	9	8
3705 user acceptance	13	2
INTERNATIONAL COMPUTERS LTD. (ICL)		
Sir John Wall talks of standards	3	6
1971 distribution outside the U.S.	3	5
INTERNATIONAL MARKET		
Foreign trade highlights	8	5
International review issue	3	
Market slowing down	4	5
Review and Forecast	10	1-8
ITEK CORP.		
Stock registration	14	8
ITEL CORP.		
Files suit against IBM with AMS	8	9
Markets Advanced Memory Systems products	8	1
Suit against IBM settled	11	4
370 leases	20	6

	Issue	Page
JAPAN		
Market outside the U.S.	3	5
Potential as market	4	6
JUSTICE DEPARTMENT		
Issues at stake in IBM case	23	4, 6
KEYDATA CORP.		
Earnings reports	21	8
KEYSTATIONS AND TERMINALS		
Estimated and projected to 1975	6	3
LAWRENCE RADIATION LAB		
Orders CDC STAR computer	1	2
LEASCO CORP.		
Leasing activities	20	6
Stock registration	8	8
LEASED COMPUTERS		
360 remarketing	4	3
370 leases	20	1
LEVIN COMPUTER CORP.		
Stock registration	1	8
MSI DATA CORP.		
Stock registration	18	8
MANAGEMENT INQUIRY SYSTEMS		
New application defined	16	2
MCDONALD MICRODATA SERVICES INC.		
Stock registration	8	8
MEASUREX CORP.		
Stock registration	5	8
MEMOREX CORP.		
MRX/40 introduced	11	2
Stock registration	14	8
MEMORIES		
Hierarchies	14	4
Review of main memory sizes by IBM	8	3
SEE ALSO Virtual Storage		
MINICOMPUTERS		
Healthy growth expected	4	4
Revenue to be up 20-25%	2	4
MULTINATIONAL DATA CORP.		
CDC joint venture with ICL, CII	3	1, 6
NATIONAL CASH REGISTER CO. (NCR)		
CDC joint venture	7	1
Customer loyalty study	12	2
European activities	3	7
Position in POS market	24	1
Review and Forecast	10	7
270 and 280 terminals	7	4

	Issue	Page
NATIONAL CSS INC.		
Earnings reported	21	8
NATIONAL DATA CORP.		
Earnings reported	21	8
NATIONAL TELEPHONE CO.		
Stock registration	6	8
NEW PRODUCTS		
Burroughs B1700	15	1
Hewlett-Packard System 3000	1	4
Honeywell Series 2000	7	6
IBM Virtual memory	19	1
IBM 370/125	23	1
IBM 3705	9	8
Memorex MRX/40	11	2
Telex 6345, 6360	11	5
Univac 9700	1	1
NIXDORF		
Teams up with AEG-Telefunken	3	1
OEM COMPONENT SUPPLIERS		
1972 outlook varied	2	6
PENRIL DATA COMMUNICATIONS INC.		
Stock registration	5	8
PERIPHERALS MANUFACTURERS		
CDC/NCR joint venture	7	1
Diminished earnings growth	4	4
PITNEY BOWES–ALPEX		
SPICE – POS system	24	1
POINT–OF–SALES TERMINALS		
Forecast to 1980	24	2
Market defined	24	1
PROGRESSIVE TELECOMMUNICATIONS INC.		
Stock registration	6	8
PUBLIC ATTITUDE TOWARD COMPUTERS		
Survey by AFIPS/Time	2	7
Q1 CORP.		
Stock registration	8	8
QUANTOR CORP.		
Stock registration	16	8
RAIR		
Defined	21	2
GE Rair services	24	5
RCA CORP.		
Customer base taken over by Univac	2	1
Customer loyalty study	12	2, 8
Losses for 1971 announced	5	5
What about RCA users?	12	8
1971 shipments	5	2

	Issue	Page
RCA SERVICE CO.		
20,000 teletypes leased	6	2
RANDOLPH COMPUTER		
Leasing activities	20	7
RAPIDATA INC.		
Earnings reported	21	8
RESOURCE SHARING		
See ARPA, SERVICE BUREAUS	8	1
REVENUES AND PROFITS		
U.S.-based mainframe manufacturers 1966-1971	5	5
REVIEW AND FORECAST		
Dedicated applications market 1966-76 (table)	10	8
General purpose computer market 1966-76	10	6
Worldwide market for U.S. manufacturers (table)	10	2
Total worldwide revenue 1961-78	10	10
Worldwide market 1966-76 (table)	10	4
SJCC		
Evaluation	14	1-6
SCAN SYSTEMS INC.		
Stock registration	14	8
SERVICE BUREAUS		
GE, Tymshare expand services	24	5
SHIPMENTS		
U.S. and worldwide 1971	5	1-6
REVIEW AND FORECAST	10	2
SIEMENS		
1971 installed	3	5
SINGER		
Plan to acquire Nuclear Data	24	1
3,000 POS installed	6	2
SOFTWARE AND SERVICES		
ADAPSO survey	22	1
Computer services review and forecast	21	1
Distribution of revenue prcviding services (table)	22	5
Management attitude toward	16	6
Software side of System/370	19	6
1972 growth to be 15-20%	2	6
STANDARD COMPUTER CORP.		
Stock registration	13	8
STORAGE TECHNOLOGY CORP.		
Stock registration	11	7
SUPPLIES MARKET		
Outlook for 1972	2	6
SYSTEMS CORP.		
Stock registration	1	8
TRW		
Credit verification terminals installed	6	2
TAPE AND DISK DRIVES		
Slower growth in 1972	2	4
TECH TRAND INDUSTRIES		
Stock registration	6	8
TELETRONIX INC.		
Stock registration	5	8
TELEX		
Announces 6345 and 6360	11	5
Leasing activities	20	7
Suit against IBM	17	4
TERMINAL DATA CORP.		
Stock registration	16	8
TERMINALS		
Estimates and projections 1970-75	13	2
Number in use	6	5
Point-of-sale terminals market	24	1
Toward distributed computing	6	1-6
SEE ALSO CRT's		
THORTON, JAMES		
Discusses STAR with EDP/IR	1	2
TIMESHARING		
New concept by ARPA	9	1-7
SEE ALSO RAIR, Service Bureaus		
TYMSHARE INC.		
Broadens services	24	5
Earnings reported	21	8
USSR		
Ryad computer troubles	17	5
UNITED COMPUTING SYSTEMS INC.		
Stock registration	11	7
UNITED DATA CENTERS INC.		
Stock registration	18	8
UNITED STATES		
U.S. vs. IBM	4	6
SEE ALSO Federal Government		
UNIVAC (Division of Sperry Rand)		
Comparison of Univac/RCA with Honeywell/GE	2	2
Customer loyalty study	12	2, 3
Review and forecast	10	2,5
Takes over RCA installed base	2	1
1971 shipments	5	2
9700 announced		

	Issue	Page
USED COMPUTERS		
Mostly old IBM equipment	4	3
VARISYSTEMS CORP.		
Stock registration	11	7
VIRTUAL STORAGE		
IBM announced	19	1
XEROX CORP.		
Stock registration	16	8
XEROX DATA SYSTEMS		
1971 shipments	5	2
XYTEX CORP.		
Stock registration	1	8

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• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" NOVEMBER 12,1971 • VOL.7,NO.1 P.J.McGOVERN,EDITOR

In the marketplace

A NEW PRODUCT HERE AND AN ANNOUNCEMENT THERE ADD UP; MAINFRAME COMPANIES CONTINUE TO EASE EVOLUTIONARY PRODUCTS INTO THE PICTURE

During the last month or so, there has been a minor flurry of mainframe activity . . . nothing so new or unexpected to rate banner headlines, but just enough to suggest there's still fight left among the computer manufacturers. The steady stream of announcements, in fact, adds an underlying tone of confidence at a time when some fundamental questions are being raised.

In addition, several recent announcements tend to suggest that the so-called "generation cycle" no longer exists as an industry norm. More and more suppliers are continuing an evolutionary approach based on marketplace needs and new product development cycles:

- Univac announced at the end of October what appeared to be cost-reduced versions of its 9200 and 9300 computer models. Then, just this week, it brought out a larger model of the 9000 series, the 9700. The computer is in the price range of Univac's 418 and 940 series machines, and compared in the announcement to IBM's 370/145.

  Before the announcement, it had been rumored that Univac would bring out a small computer in the System/3 range. This didn't happen. So when Univac confirmed it still had serious interest in acquiring at least part of RCA's remnants, observers couldn't help but think about the small business computer RCA had been ready to announce before it withdrew from the computer business.

- Burroughs, to no one's great surprise, announced the B4700 series during the last portion of October. The five different models in the series seem to be designed primarily as upgrades for 2500/3500 users, and use the extensive software library developed for these mainframes. Because of this, the company says, the B4700 comes to the marketplace in a state of "instant maturity."

  This concept looks more like name changing than anything else. The B4500 was due to be delivered this month; coincidentally, Burroughs announced that the first deliveries of the B4700 were being made at the time of the announcement.

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In addition to these announcements of gap-filling or evolutionary products, there has been some other activity worthy of note:

- Control Data, during the fall, finally released details on its Star-100 after announcing that at least one commercial order -- from General Motors -- had been chalked up alongside the more-or-less "standard" order from Lawrence Radiation Lab.

- Hewlett-Packard, boldly moving up into the general-purpose market, introduced a "small" computer designed from the ground up to handle time-sharing, real-time, and multi-program batch operations. It will be demonstrated at the Fall Joint Computer Conference in Las Vegas next week.

- Honeywell -- nine months after announcing that the GE 600 line was being upgraded to the HIS 6000 series -- reported its results with the large line. In less than a year HIS has booked just about as much 6000 business as the 600 achieved in more than four years of marketing. And a significant portion of the orders are new or supplemental rather than simple one-for-one upgrades of existing equipment.

CONTROL DATA MOVES AHEAD WITH STAR -- A NEW CONCEPT IN SUPERCOMPUTERS

Our major business strategy -- simply stated -- is big computers.

That's what William C. Norris, Control Data chairman, said three years ago when he presided over the official introduction of the 7600. That machine went out the door as "the world's most powerful computer," and will continue to hold that title until early 1972 when the AEC's Livermore laboratory receives its Star-100. General Motors will take delivery of the second copy of this $12-million-plus computer about a year later.

What is the Star-100?

There has never been an official introduction of the Star-100. It has been talked about less and less guardedly since about two years ago, when all that was known was that Star stood for STring-ARray processor. CDC began describing Star a little more openly this fall:

- In announcing its first commercial order from General Motors, CDC described the Star-100 as a system to be used in advanced applications. One of its "major innovations" is the "distribution of computation resources through the physical distribution of computing functions." Users, said CDC, would have quick access to arithmetic and logical power of the computer "within a common data base described by a virtual memory of up to 4 trillion words."

- In a presentation to the IEEE International Computer Society Conference in Boston this fall, one of Star's project leaders described it as "an extremely large and powerful computer system . . . for use as a large computing engine at the center of a distributed network of other computing systems. . . [Major] considerations are the data streaming properties of the central processor and memory and the distribution of system resources into intelligent stations."

- In a recent interview with EDP/IR, James Thornton -- CDC vice president, key member of the 6600 design team, and chief architect of Star -- tried

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to summarize a little better: "Star is a smooth evolution of the revolutionary distributed system ideas introduced with the 6600. It incorporates hardware advances without the gross cliffhangings associated with state-of-the-art technology. Star is designed for solving problems with large arrays of data; it has a new class of higher level instructions; and it takes advantage of bandwidth rather than access time. Thus, the approach can be applied only to large machines, and it is different from other approaches being taken.

One approach to vastness

As computer system designers look to the future, most of them realize that vast networks will be increasingly important. All of these networks will include extensive calculation and data management capabilities. The approaches being suggested in technical papers -- or through experimental systems -- today seem to have two thrusts: a computer network, or a network of computers.

Suggestions as to the second approach -- setting up a network of computers -- have included up to 500 minicomputers in a communications link. This could well have application where interaction rather than data base access is of prime importance. It is, however, pegged primarily to communications.

A more practical experiment with a network of computers is currently in process. The Advanced Research Projects Agency (ARPA) of the Defense Department has currently linked together more than 20 computers at 15 locations across the country. One of these is Illiac IV, a large research computer that itself contains many specialized function computers. In an upcoming issue, EDP/IR will discuss the economics of this experiment in more detail.

CDC's Star represents the other approach. In fact, Star is a single computer constructed in the form of a network. Its designers often refer to it as a new philosophy of computing. It is built around 512-bit superwords that flow through the central processor about as fast as single bytes or words in other computers. Yet, for the first time in CDC's history, information stored in the computer can be addressed by bit, 8-bit byte, 32-bit half-word, or 64-bit word unit. A comparison with CDC's other supercomputers gives an indication of Star's performance:

CDC Model	Access Time	Size of Word Accessed
6600	600 million bits/sec.	60 bits
7600	2,300 million bits/sec.	60 bits
Star	12,800 million bits/sec.	512 bits

It can be seen from the above that it is not the speed per bit that has been improved on Star (as it was in the 7600 vs. the 6600), but the number of bits that flow through the computer in a given time period. This is the broad bandwidth the designers talk about. And because of this, the computer is oriented to handling large arrays of vectors, each of which is a large string of data.

New types of instructions

In addition to continuing concepts of phased multiple memories and parallel processing units implemented in the 6600, Star has incorporated new types of instructions into its hardware. Many of the ideas behind this construction can be traced to the Advanced Programming Language created by Iverson of IBM shortly be-

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fore System/360 was introduced. As Thornton puts it: "Star is not an APL machine, but it will run APL problems very well."

In addition to advanced instructions for floating point arithmetic, multiprocessing, and various indexing methods used in many computers today, Star's instruction set includes a fourth type of macro instruction. One of these, for example, can tell the machine to "perform a polynomial evaluation of each element of up to 65,000 elements long."

If it's good for General Motors???

As would be expected, the first Star-100 will be shipped to the AEC's Lawrence Radiation Laboratory facility in Livermore, Calif. This has been a home for Serial No. 1 of almost every supercomputer built; researchers there always seem to have problems that keep giant number-crunchers happy. So when it gets there, Star will go right to work handling normal production problems while scientists carry out timeshared debugging and learn to write problems that take advantage of the new macro instructions.

The second Star booked by CDC sounds more interesting. General Motors has been closemouthed as it often is about advanced production and design equipment. But the fact that Star "is to be used in advanced applications which involve many graphics display terminals," is reminiscent of the big play GM made over DAC-1 (Design Automated by Computers) at the Fall Joint Computer Conference in 1964. At that time, GM announced "an experimental computer facility that may someday be used by General Motors engineers to help create new automotive designs."

When DAC-1 was announced, system designers felt that widespread use of the system would require two to three orders of magnitude improvement in computer capability and was probably 10 years away. By that time (1974), a company spokesman said, "this country may be forced to use its creative dynamic capabilities rather than its mass-production capabilities." Perhaps the auto company's research plans are progressing on schedule!

HEWLETT-PACKARD ANNOUNCES GENERAL-PURPOSE COMPUTER FOR MULTI-PURPOSE USE

Before CDC's Star came onto the scene (story, page 2), Burroughs was about the only company that offered a computer system in which hardware was designed with software in mind and oriented toward the efficient compilation of high-level languages. This approach was a technological innovation when it was introduced in 1963 with the B5000, and has been continued into the Burroughs "700" family. But it hasn't appeared in other computer families . . . probably because the coordination involved requires much design cooperation and flexibility.

Now -- moving up through minicomputers from instrumentation -- Hewlett-Packard has done much the same thing. System/3000, which HP will be demonstrating at Fall Joint, is described as a "radical new architectural approach to the design of small central processors." The computer is built around an Algol-type high level language, and features what HP calls Systems Programming Language. Not only can the System/3000 be programmed in SPL; SPL itself is written in SPL. This is possible because the computer has 170 unique instructions, many built into the computer to make SPL work more easily. As a result, the company says that program coding is accomplished three-to-six times faster than with traditional assembly languages.

With a computer selling for $100,000 to $300,000 (or renting for $2,000 to $6,000 a month) HP has certainly moved up into the company of general-purpose com-

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puter manufacturers. But company officials point out that the new computer is not going to be sold head-on against the IBM/370 or its other principal competitors. HP does expect, however, to come up against DEC's new PDP-11/45 or XDS's Sigma 5.

And the company has set realistic goals: First deliveries will be in mid-1972, and shipments are set to reach 10 a month by the start of 1973. Rentals, if desired, will be financed by HP at about 2% of purchase price per month. During the first year, at least, marketing will be concentrated in two areas:

- Data acquisition and automatic testing, where HP is already established through the instrumentation supplied by other company divisions. In making sales in this marketplace, HP representatives could well come up against IBMers trying to install System/7s in similar functions.

- Education: Computer assisted instruction in primary schools, problem solving via timesharing in secondary schools, timesharing and as front end to larger computers in colleges and universities. In addition, some administrative functions can be handled in each application.

HP will obviously seek out other types of users as production builds up and customer acceptance is measured. The move will certainly not establish HP as a major force in the overall computer industry. Not for quite some time, anyway. But the move could prove very important for HP. The traditional minicomputer market is going through much change at present, and may not exist in its present form much longer (EDP/IR June 25,1971). HP seems to have detected this, and opted for new directions soon enough. It has come up with a hardware/software approach that many users swear by today; only time will tell whether HP can parlay it into the loyal user base like that which Burroughs has built.

HONEYWELL MAKES HAY WITH IMPROVED VERSION OF LARGE GE PROCESSOR

When Honeywell announced the Series 6000 family of large-scale computers last February, it looked like an obvious move to protect the $225 million base of GE 600 computers installed around the world. It also implied that HIS would follow the GE technical direction -- at least in the large product area and at least until a possible compatible new family could be developed. The approach seems to be working.

Nine months of marketing results for the 6000 line were announced this week, and they are impressive. Honeywell reported orders for more than 100 Series 6000 computers worth over $190 million in addition to the order for 9 systems and an option for 26 more from the U.S. Department of Defense for the WorldWide Military Command and Control System (WWMCCS), valued at $51.3 million.

Orders for the 6000s have come from a wide variety of businesses and government agencies in many parts of the world: Ford Motor Co.'s product development group; the Fulton National Bank in Atlanta; the social security branch of the Swedish government; the Paris transit authority; Bell Telephone Co. of Canada. All models of the family handle timesharing, remote and local batch, and transaction processing . . . all having access to the same large data base. Rentals start at $25,000 a month, purchase at $1 million.

Even though the U.S. installed base of GE 600 computers is twice the size of that outside this country, it looks as if 40% to 45% of the Honeywell orders are for shipment abroad. This illustrates the continuing demand for larger computers in the international marketplace. This market is still much less saturated overseas than in the U.S., where most large computer sales are upgrades for current users.

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GENERAL PURPOSE COMPUTER CENSUS

Counts in the General Purpose Digital Computer (Group A) Census, shown below, are based on the best information available to the International Data Corporation, but are estimates. Computer manufacturers, as a rule, do not directly supply this type of information, and it is only through the use of IDC's extensive data files and other information sources that such estimates are possible. The computers included in "Group A" comprise the bulk of digital computers in operation. They are byte or character oriented -- with the exception of large-scale scientific machines -- and are primarily programmed with higher-level languages. In addition to this Census, EDP/IR publishes a Dedicated Application Digital Computer (Group B) Census that includes minicomputers and specialized-purpose machines.

AS OF SEPTEMBER 1, 1971

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Burroughs	205	$ 4,600	1/54	1	5	6	X
	220	$ 14,000	1/58	6	2	8	X
	B-100 Series	$ 3,300	8/64	10	0	10	X
	B-200 Series	$ 6,500	11/61	237	142	379	X
	B-300 Series	$ 8,000	7/65	502	94	596	X
	B-500	$ 3,800	11/68	350	335	685	80
	B-2500	$ 6,500	2/67	215	79	294	40
	B-3500	$ 14,700	5/67	380	240	620	110
	B-4500	$ 29,000	11/71	-	-	-	45
	B-5500	$ 33,500	3/63	131	38	169	X
	B-5700	$ 27,000	12/70	17	2	19	35
	B-6500	$ 70,000	11/69	19	18	37	X
	B-6700	$ 67,000	2/71	8	4	12	18
	B-7700	$120,000	2/72	-	-	-	4
	B-8500	$200,000	4/69	1	0	1	X
	Subtotals			1877	959	2836	332
Control Data Corp.	G-20	$ 19,600	4/61	5	8	13	X
	1604/A/B	$ 42,000	1/60	27	5	32	X
	31/3150	$ 10,500	12/64	100	67	167	X
	3170	$ 16,700	12/70	6	1	7	6
	3200	$ 14,000	5/64	62	55	117	2
	3300	$ 20,500	9/65	113	100	213	7
	3400	$ 23,700	11/64	4	12	16	X
	3500	$ 25,000	1/69	4	10	14	X
	3600	$ 48,000	6/63	21	22	43	X
	3800	$ 53,000	12/65	11	5	16	X
	6200	$ 39,000	11/70	6	0	6	3
	6400	$ 55,300	5/66	60	34	94	7
	6500	$ 65,500	12/67	14	2	16	X
	6600	$127,000	8/64	60	33	93	3
	6700	$137,000	7/70	5	0	5	2
	7500	$190,000	1/69	10	0	10	4
	Cyber-72	$ 25,000	10/71	-	-	-	NA
	Cyber-73	$ 50,000	3/72	-	-	-	NA
	Cyber-74	$150,000	3/72	-	-	-	NA
	Cyber-76	$200,000	3/72	-	-	-	NA
	Star-100	$260,000	11/71	-	-	-	2
	Subtotals			508	354	862	36
Digital Equipment Corp.	PDP-6	$ 10,000	10/64	17	6	23	X
	1040/1050	$ 13,300	10/67	126	54	180	4
	1055	$ 25,000	12/71	-	-	-	2
	1070/1077	$ 34,600	6/72 - 9/72	-	-	-	NA
Friden	System 10	$ 2,500	10/70	75	55	130	600
Honeywell	G-5X Series	$ 1,400	1/66	80	1720	1800	265
	G-105	$ 1,350	3/69	24	65	89	20
	G-115	$ 2,500	4/66	248	1270	1518	120
	G-120	$ 3,200	1/70	29	155	184	50
	G-130	$ 4,400	10/69	3	130	133	35
	G-205	$ 2,900	6/64	4	0	4	X
	G-210	$ 16,000	3/60	19	0	19	X
	G-215	$ 6,000	9/63	6	0	6	X
	G-225/255	$ 8,500	4/61 -10/67	142	22	164	X
	G-235/265	$ 14,500	4/64 -10/65	66	23	89	X
	G-245/275	$ 18,000	2/68 -11/69	4	2	6	X
	G-405/410	$ 7,200	2/68 -11/69	24	4	28	X
	G-415/420	$ 7,600	5/64 - 6/67	185	230	415	X
	G-425/430	$ 13,200	6/64 - 6/69	68	84	152	4
	G-435/440	$ 14,800	9/65 - 7/69	39	20	59	1
	G-615	$ 55,000	6/69	14	11	25	3
	G-625	$ 65,000	4/65	1	4	5	X
	G-635	$ 80,000	5/65	61	22	83	X
	G-645	$120,000	7/66	4	0	4	X
	G-6030/6040	$ 25,000	7/71 - 3/72	3	1	4	22
	G-6050-6060	$ 46,500	7/71 - 3/72	2	0	2	43
	G-6070-6080	$ 61,500	7/71 - 3/72	1	0	1	15
	G - Subtotal			1027	3763	4790	578
	H-105	$ 2,100	11/71	-	-	-	75
	H-110	$ 3,200	9/68	166	118	284	30
	H-115	$ 4,000	3/70	400	148	548	120
	H-115/2	$ 5,060	1/71	90	38	128	90
	H-120	$ 5,000	1/66	584	307	891	X
	H-125	$ 7,400	12/67	152	360	512	35
	H-200	$ 7,600	3/64	584	304	888	X
	H-1015	$ 8,400	4/71	45	14	59	60
	H-12/1250	$ 10,500	2/66 - 8/68	346	148	494	X
	H-2015	$ 12,800	2/71	63	12	75	55
	H-2200	$ 19,600	1/66	120	63	183	6
	H-3200	$ 23,000	2/70	61	26	87	30
	H-4200	$ 28,500	9/68	29	7	36	6
	H-8200	$ 50,000	2/69	18	4	22	4
	H-400	$ 10,600	12/61	39	30	69	X
	H-1400	$ 14,000	1/64	4	6	10	X
	H-800	$ 26,000	12/60	49	14	63	X
	H-1800	$ 46,000	7/64	14	3	17	X
	H - Subtotal			2764	1602	4366	511
	HIS Subtotals			3791	5365	9156	1089

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AS OF SEPTEMBER 1, 1971

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
IBM	System-3	$ 1,400	1/70	4,650	850	5,500	4500
	360/20	$ 4,200	12/65	8,400	6,000	14,400	X
	360/22	$ 5,600	7/71	125	15	140	450
	360/25	$ 8,000	10/68	2,100	1,150	3,250	100
	360/30	$ 12,300	6/65	6,500	3,400	9,900	50
	370/135	$ 16,200	5/72	-	-	-	1350
	360/40	$ 22,000	5/65	3,070	1,965	5,035	X
	370/145	$ 28,900	7/71	160	70	230	1430
	360/44	$ 13,800	7/66	120	105	225	X
	360/50	$ 36,500	8/65	1,160	620	1,780	X
	370/155	$ 50,900	2/71	197	66	263	1040
	360/65	$ 69,000	11/65	635	215	850	X
	370/165	$ 89,000	6/71	20	5	25	330
	360/67	$138,000	6/66	66	9	75	X
	360/75	$ 91,000	1/66	53	22	75	X
	360/85	$155,000	10/69	14	6	20	X
	360/9X	$150,000	11/67	13	4	17	X
	360/195	$210,000	3/71	2	0	2	6
	370/195	$215,000	5/73	-	-	-	2
	1130	$ 2,200	2/66	3,750	1,720	5,470	50
	305	$ 3,600	12/57	1	18	19	X
	650	$ 4,800	12/54	4	29	33	X
	1401	$ 6,200	9/60	1,600	1,800	3,400	X
	1401-G	$ 2,300	5/64	180	70	250	X
	1401-H	$ 1,300	6/67	77	17	94	X
	1410	$ 17,000	11/61	140	115	255	X
	1440	$ 4,100	4/63	575	490	1,065	X
	1460	$ 9,800	10/63	100	56	156	X
	1620	$ 4,000	9/60	405	275	680	X
	7010	$ 26,000	10/63	33	11	44	X
	7030	$160,000	5/61	4	2	6	X
	704	$ 32,000	12/55	3	4	7	X
	7040	$ 25,000	6/63	21	27	48	X
	7044	$ 36,500	6/63	22	24	46	X
	705	$ 38,000	1/56	19	7	26	X
	7070/74	$ 27,000	3/60 - 2/61	161	50	211	X
	7080	$ 60,000	8/61	63	1	64	X
	7090	$ 63,500	8/60	27	27	54	X
	7094	$ 73,400	9/62	74	11	85	X
	7094-II	$ 79,400	4/64	18	0	18	X
	Subtotal			34,562	19,256	53,818	9308
NCR	Century-50	$ 1,650	2/71	120	10	130	125
	Century-100	$ 2,600	9/68	1450	475	1925	125
	Century-200	$ 7,700	9/69	415	185	600	110
	Century-300	$ 20,000	2/72	-	-	-	20
	304	$ 10,000	1/60	10	2	12	X
	310	$ 1,000	5/61	8	0	8	X
	315	$ 7,000	5/62	340	370	710	X
	315-RMC	$ 9,000	9/65	125	50	175	X
	390	$ 800	5/61	265	410	675	X
	500	$ 1,000	10/65	950	1800	2750	50
	Subtotal			3683	3302	6985	430
Philco	1000	$ 7,000	6/63	13	1	14	X
	210/211	$ 40,000	10/58	12	1	13	X
	212	$ 52,000	1/63	12	1	13	X
RCA (*)	2	$ 14,600	7/71	5	0	5	45
	3	$ 19,600	10/71	-	-	-	26
	6	$ 29,900	10/71	-	-	-	24
	7	$ 40,100	10/71	-	-	-	20
	Spectra 70/15	$ 5,100	9/65	32	125	157	10
	Spectra 70/25	$ 7,900	9/65	11	60	71	X
	Spectra 70/35	$ 13,600	1/67	175	225	400	30
	Spectra 70/45	$ 23,100	11/65	345	190	535	20
	Spectra 70/46	$ 40,200	11/68	59	6	65	6
	Spectra 70/55	$ 41,600	11/66	20	16	36	X
	Spectra 70/60	$ 43,100	9/70	13	4	17	9
	Spectra 70/61	$ 55,000	3/71	10	0	10	6
	301	$ 9,500	10/60	241	288	529	X
	3301	$ 25,000	7/64	66	5	71	X
	501	$ 17,000	6/59	38	5	43	X
	601	$ 50,000	11/62	4	0	4	X
	Subtotal			1019	924	1943	196
Standard Computer Corp.	IC-4000	$ 9,000	9/68	16	0	16	X
	IC-6000	$ 16,000	5/67	9	0	9	X
	IC-7000	$ 17,000	6/69	19	0	19	X
Univac	I/II	$ 25,000	3/51 -11/57	7	3	10	X
	III	$ 25,400	8/62	43	42	85	X
	SS-80/90	$ 8,000	8/58	67	69	136	X
	418-I/II	$ 13,700	6/63 - 9/64	87	131	218	X
	418-III	$ 19,600	7/69	32	49	81	14
	491/492	$ 27,000	12/61	21	14	35	X
	494	$ 41,400	2/66	62	49	111	4
	1004	$ 1,900	2/63	1000	1280	2280	X
	1005	$ 2,550	4/66	670	180	850	X
	1050	$ 8,800	9/63	200	180	380	X
	1103/1105	$ 35,000	12/50 - 9/58	5	2	7	X
	1106	$ 40,000	12/69	33	34	67	22
	1107	$ 57,000	10/62	16	19	35	X
	1108	$ 68,000	9/65	142	106	248	12
	1110	$ 79,000	11/71	-	-	-	6
	9200	$ 1,700	6/67	1400	690	2090	150
	9300	$ 4,000	9/67	900	910	1810	185
	9400	$ 10,000	5/69	117	135	252	55
	Larc	$135,000	5/60	1	0	1	X
	Subtotal			4803	3893	8696	448
Xerox Data Systems	Sigma-5	$ 11,500	8/67	220	59	279	20
	Sigma-6	$ 20,000	11/70	11	2	13	8
	Sigma-7	$ 24,000	12/66	98	34	132	4
	Sigma-8	$ 19,000	9/71	1	0	1	8
	Sigma-9	$ 44,000	9/71	1	0	1	6
	940	$ 24,000	4/66	40	8	48	X
	9300	$ 8,500	11/64	25	6	31	X
	Subtotal			396	109	505	46
	TOTALS			50,938	34,280	85,218	12,491

* RCA figures for outside the U.S. include predominantly those computers marketed and manufactured under cross-licensing agreements by Siemans in Germany, ICL in England, Bull Gamma in France, and Hitachi in Japan.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

COMPUTER AUTOMATION, INC.	Computer Automation, Inc., 895 West 16th St., Newport Beach, Cal. 92660, offering two series of low-cost digital computers, on Oct.1 filed 250,000 common. Of the proceeds, $8 per share maximum, $600,000 will repay short-term bank loans. Public sale by F.S. Bonahue, Santo & Co., 176 Riverside Ave., Red Bank, N.J. 07701.
COMPUTER HORIZONS CORPORATION	Computer Horizons Corp., 30 East 42nd St., New York, N.Y. 10017, providers of consulting, systems analysis and design, and programming services to EDP users, on Oct. 29 filed 220,000 common. Underwriter is Mayflower Securities Co., Inc.
GENERAL AUTOMATION INC.	General Automation, Inc., 1055 South East St., Anaheim, Calif. 92806, a minicomputer firm, filed 275,000 common on Oct. 27. Proceeds, from sale at maximum $14 per share, will repay bank borrowings and provide working capital, etc. Underwriters are headed by Bateman Eichler, Hill Richards, Inc., 460 South Spring St., Los Angeles, Calif. 90013.
HONEYWELL FINANCE INC.	Honeywell Finance Inc., 2701 Fourth Ave. South, Minneapolis, Minn. 55408, which finances customer receivables of Honeywell Information Systems, Inc., resulting from contracts for the lease or installment sale of computer systems and related products, on Oct.5 filed $50 million debentures, due 1978. Proceeds will be used to reduce short-term indebtedness incurred in connection with the purchase of customer obligations and for other corporate purposes. Honeywell Finance is a wholly owned subsidiary of Honeywell, Inc. Underwriters are headed by Eastman Dillion, Union Securities & Co., Inc., One Chase Manhattan Plaza, New York, N.Y. 10005.
LEVIN COMPUTER CORPORATION	Levin Computer Corporation, 224 East 49th St., New York, 10017, the general partner, on Oct. 8 filed $4 million limited partnership interests in System/370 Computer Lessor Program, in $5,000 units. The partnership's purpose will be the purchasing of IBM System/370 computers for lease to others.
THE SYSTEMS CORPORATION	The Systems Corporation, 1441 Kapiolani Blvd., Honolulu, Hawaii 96814, a computer service company, on Oct. 6 filed 300,000 common. Minimum purchase is 100 shares at $5.50. The company will spend $400,000 on development of applications software packages and the remaining proceeds go for working capital and other purposes.
XYTEX CORPORATION	Xytex Corporation, 1779 29th St., Boulder, Colo. 80302, a company organized in October 1970 to design, develop, manufacture, and market a large capacity data storage subsystem and other related computer peripheral equipment, on Oct. 26 filed 400,000 common. Of the proceeds, $1.6 million will finance the leasing of subsystems and the balance goes for working capital and other purposes. Underwriters are J.H. Kern and Company, 40 Wall St., N.Y.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" NOVEMBER 30,1971 • VOL.7,NO.2 P.J.McGOVERN,EDITOR

Consolidation continues

UNIVAC 'AGREES IN PRINCIPLE' TO TAKE OVER RCA'S NORTH AMERICAN CUSTOMERS; PRICE FOR REGAINING NUMBER TWO SPOT IS $70 MILLION NOW, UP TO $60 MILLION LATER

Eight weeks and about one hour after RCA announced it would abandon the computer industry (EDP/IR Sept.29,1971), Univac disclosed the deal by which it would step in and pick up the pieces. Details won't be announced for a few more weeks, but the "agreement in principle" shows how fast a computer declines in value when it is abandoned by its manufacturer.

Upon completion of the deal, Univac will edge back in as Number Two among U.S.-based mainframe manufacturers.

Under "tentative terms of the agreement," RCA will pay Sperry Rand about $70 million on Jan. 7, 1972 plus "a varying percentage of future revenues over a five year period. Current estimates are that the total value of these succeeding payments will amount to between $30 million and $60 million." This essentially will be a sliding scale arrangement based on how long RCA's $520-million rental base continues to generate revenues for Univac.

The two companies have set Dec. 17 as the deadline for completion of negotiations and the execution of the final agreement, set to close on Dec. 31. Thus, after two months of speculation and constant rumors, RCA customers and industry participants alike finally have the answer to the question that has taken up more pages of print than any subject in recent computer industry history. For its money, Univac will get a package that includes:

- RCA's customer base. Univac will pick up responsibility for over 500 customers with over 1000 RCA computers installed at more than 700 sites in the U.S., Canada, and Mexico. There is very little customer overlap, so this will give Univac salesmen a 10% increase in site coverage. A few new types of users will be added to the Univac portfolio, to be sure; but the new customers won't change the basic mix for Univac: After purchasing the RCA base, Univac will have one-third of its U.S. computers in industrial companies (vs. 38% for all manufacturers); one-fourth in Federal, state, and local government (vs. 12%); the remainder distributed fairly close to the overall pattern. The initial payment is just over one half the rental payments current RCA users will pay during 1972 . . . assuming they keep their equipment.

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- Additional personnel. On an individual basis, Univac will offer jobs to "some 2,500" technical and marketing people of the remaining 8,000 RCA computer division employees. This will not only allow Univac to service its newly acquired accounts without spreading existing personnel too this; it should also provide a smooth transition for those customers who might otherwise have left to fend for themselves.

- Tools for maintenance. In addition, Univac will "have access to certain existing RCA test and check-out facilities as well as to spare parts inventory necessary to service the RCA users." Service is expected to be offered to RCA users who own their computers as well as to those who rent.

Obviously, Univac is betting that many RCA customers are sufficiently anti-IBM to use the equipment they have until an upgrade is needed . . . then switch to a Univac system rather than selecting another vendor. There are questions as to what portion of RCA's installed base will elect to follow this route.

For one thing, about 30% of the RCA computers in the U.S. are operating alongside an IBM computer. This probably represents about half the current rental base by value. Customers with this high an investment in IBM compatibility are not very likely to move away from it when an upgrade is called for. Also, about 20% to 30% of RCA's rental base has a long-term lease plan with an attractive option to purchase. Whether or not these customers will switch isn't known.

Univac, however, seems to have anticipated the RCA purchase when it announced the 9700 (EDP/IR Nov.12,1971). This computer is microprogram compatible with the older 1400 series IBM equipment, and -- according to Univac -- has an operating system that will handle 360 programs written for use with a disk system (DOS). Thus, there already seems to be a little choice, and Univac will certainly develop other means for easy conversion.

The shuffle for No. 2 slot

The figures will be close, but -- based on yearend 1970 estimates -- Univac will move back into the Number Two position after it executes the agreement with RCA. During 1970, Univac lost this position when Honeywell's computer division was merged with GE's to form Honeywell Information Systems, Inc. (HIS).

COMPARISON OF UNIVAC/RCA, HONEYWELL/GE WORLDWIDE COMPUTER OPERATIONS
(International Data Corporation estimates as of yearend 1970)

	Univac	RCA(a)	Total	Honeywell	GE	HIS
Installed Value ($M)	$2,223	$ 834	$3,057	$1,483	$1,098	$2,581
Value on Rent ($M)	$ 956	$ 516	$1,472	$ 990	$ 570	$1,560
# Systems Installed	8,560	1,071	9,631	3,964	4,344	9,308
# Sites	7,250	730	7,980	3,500	3,770	7,270
Personnel	51,000	2,500	53,500	24,000	27,000	44,000

(a) U.S. computer base only; does not include Canada or Mexico

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Several interesting observations can be made from the data presented above. The Honeywell-GE combination was a true merger . . . of similar-sized operations. Univac -- if its purchase from RCA is completed -- will end up with 5% more people, 9% more sites, 11% more systems installed, 28% more value of equipment, and a 35% larger rental base. And its new profile will be quite similar to that presented by HIS, even a year ago.

Neither company, however, has ratios that approach those maintained by IBM. Each "merged dwarf" can show just less than $60,000 in installed equipment per employee; IBM, on the other hand, has about $135,000. Similar comparisons show the economies inherent in consolidated operations, and operational efficiency still to be attained.

What's left

Assuming the Univac purchase goes through -- and many problems still remain to be worked out -- RCA has other assets to sell or redistribute before it can be out of the computer business. Among these are two manufacturing facilities (at West Palm Beach, Fla. and Marlboro, Mass.) and the associated R&D/engineering departments, peripherals and supplies businesses, foreign licensing and supply agreements, and almost 6,000 employees.

Mohawk Data Sciences, which says it bid more for RCA's package than Univac, is still a prime candidate for at least a portion of what's left; Digital Equipment, HIS, and Xerox are reportedly looking at the manufacturing facilities. And portions of what is left will probably be absorbed by RCA itself as the nucleus of its intentions to continue in the "development, manufacture and marketing of specialized data communications systems for application in such areas as government and defense, communications networks, and specially designed business systems."

Siemens -- RCA's principal European outlet for computers -- had been planning to achieve manufacturing independence from the U.S. within a year or so, and it probably will continue along these lines . . . accepting delivery of some $40 million worth of RCA computers during 1972, as planned. RCA Corp. has many other arrangements with the West German manufacturer, so it is expected that all details in this regard will be worked out amicably.

Once all this is done, what's really left is a restructured computer industry. Instead of "Snow White and the Seven Dwarfs" talked about for several years, we now have IBM with almost 70% of the mainframe business, two major competitors with nearly 10% each, and several other companies looking for a secure portion of the 10% or so that's left. That's the new structure of the mainframe market. It may mean more dropouts or mergers; it may mean specialization or entrenchment; it definitely means a new way of looking at things as 1972 gets underway.

SURVEY OF FJCC EXHIBITORS SHOWS RENEWED BUSINESS CONFIDENCE FOR 1972

Despite the low attendance at this year's Fall Joint Computer Conference -- 17,000, or less than half that of 1969 -- exhibitors felt generally good about 1972 business prospects. With none of the mainframe companies present, the 1971 FJCC was an intra-industry show. Few end users were on hand, either; so participants had a good chance to examine other products and set up OEM or marketing arrangements.

A number of major exhibitors did take time from all this incest, however, to respond to an on-the-spot survey of marketing and planning executives conducted by

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EDP Industry Report and other representatives of the International Data Corporation, its publisher. Although the results are not statistically significant, they do give some good indications of what things look like in a large cross section of the marketplace:

- Most exhibitors were quite optimistic about expected increases in their own business, less so about their competitors'. Underneath the marketing myopia that exudes from most sales executives, show participants seemed to anticipate a 9-12% increase in business during 1972.

- These companies do not see their foreign markets as quite the cushion they have been. As the recession takes hold in Europe, prospects there appear no better than they do here. Companies in those areas that could benefit from the economic downturn -- plug-compatible peripheral manufacturers for example -- don't have reputations as established as in the U.S.

- Few exhibitors foresee any direct effect of price and wage controls or the investment tax credit on EDP equipment acquisition decisions. Many, as suggested by EDP/IR (Aug. 31, 1971), thought that if these measures continue to be good for the U.S. economy, they will in turn be good for the EDP business.

Because the business outlook for any given company depends partly on the particular sector of the industry in which it participates, EDP/IR divided the results of its survey into appropriate categories.

Minicomputer revenues to be up 20-25%

With backlogs up about 18-20% for the year, minicomputer suppliers anticipate a 1972 growth in business revenues -- rental and purchase -- of 20-25%. As the recession fades, vendors expect backlogs to increase even further during 1972 and price pressure from the OEM market to decline. This boost is attributed partially to the Nixon economic policy's encouragement of capital spending, which includes minicomputers as well as related process control and manufacturing equipment. As a result of increased business, these marketeers look for an increase in profit margins because higher volume incurs lower marginal costs.

Overseas, mini-makers expect that the onslaught of recession will cause the international portion of their business to shrink a bit from the current level of 30-40% of total.

Growth in tape and disk drives somewhat slower

Plug-compatible tape and disk drive producers at the show anticipated only about 10-20% more revenues for 1972, despite a backlog increase of 22-25% from this time last year. They report that IBM's fixed-term lease plan (EDP/IR Aug. 31, 1971) slowed them down over the summer, but that the influx of orders has subsequently picket up. The sting continues, however, in profit margins. Profits on compatible products have fallen 25-40% in 1971 and will decrease more during 1972.

Growth in the tape drive market looks particularly encouraging as users begin to opt increasingly for compatible 3420 drives. Double density 2314 disk drives, on the other hand, are moving slowly, with user education a major problem. Vendors view this product as only an interim measure to fill the gap before introduction of 3330-compatible drives.

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Vendors expect that the price and wage controls will indirectly benefit the plug-compatible market because user management will seek further cost savings in EDP operations to improve internal margins. Marketing costs will continue at a new higher level, however, because of stiff competition from IBM with its lower cost, fixed-term lease arrangements.

The international recession, here as elsewhere in the industry, could hamper growth potential overseas. However, suppliers hope that European users will soon avail themselves of cost-saving compatible peripherals.

Large-scale systems to boost data entry market

Orders for large-scale data entry systems will probably be up about 20% in 1972, with key-to-tape products continuing to slow. Overall, manufacturers expect the market for on-site data entry equipment to increase 15-20% as a result of a 15% increase in backlogs over last year. After little or no improvement in 1971, profits could rise nicely in 1972 as a result of price and wage controls.

Other factors influencing the behavior of this marketplace will include user management's desire to effect even greater cost savings and the appearance of new products, both from IBM and from others, to fill this need. The offsetting facets of this interaction make the uncertainty of the marketplace sufficiently great to hinder the participants in gaining outside financing.

Overall growth, however, will continue as management recognizes the cost savings available from new approaches and replaces keypunch equipment. In addition, newly introduced editing and data formatting features may bring new applications.

Vendors in this market segment are more hopeful of their growth in the international arena. Most have already set up substantial European marketing operations in anticipation of increased market penetration there in 1972.

Communications equipment and remote terminal producers most optimistic

With the highest increase in backlog, the communications and remote terminal sector also anticipates by far the highest growth rate for 1972 -- 30-35%. The increase in backlog for communications equipment has been 35% for the past twelve months, and suppliers expect additional increases of 20-25% in 1972, stimulated by new applications.

Profitability varies by product line, but suppliers expect margins in general to improve with increased production economies. For low-speed modems and CRT terminals, these economies will serve in part to offset the price decreases caused by stiff competition.

Major growth potential in such areas as banking/financial institutions and retail/wholesale distribution centers should receive a stimulus from Nixon's Phase II; the manufacturing and chemical process industries will look brighter with the investment tax credit. Unfortunately, however, price competition and instability in the terminal marketplace during 1971 has made both users and investors leary of commitments with small firms.

The international market is still virtually non-existent for U.S. communications and terminal suppliers. In a reverse twise, however, ITT will be introducing some European terminals into the U.S. marketplace.

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Outlook bleak for supplies market

Exhibitors in the supplies market were discouraged about 1972 business prospects, with little or no growth expected. This sector is the only one where backlogs have actually decreased, as users consumed inventories of tapes, disk packs, business forms, and punch cards. New developments by IBM are hurting growth potential here because customers are awaiting 3330 deliveries rather than installing additional 2314/2319s. The new drive will also lower requirements for packs per spindle as a result of increased capacity per pack. Whatever growth occurs will probably depend on the overall growth of the economy.

Price cutting caused profits on EDP supplies to decline about 8-10% in 1971, and near-term improvement is unlikely. Stiff competition overseas douses the hopes of these vendors from gaining much ground there either.

Software and services buoyed by general business improvement

Despite a relatively small number of exhibitors and low level of user interest, but not necessarily dollar backing, the survey found growth rates in the software and services sectors of 15-20% quite justifiable. Timesharing and remote-batch revenues are growing, and EDP users are beginning to show more interest in software packages that will enhance System/360 performance. Realistically, however, the growth that actually occurs will probably result primarily from general increases in business levels throughout the economy. Business failures among timesharing and other service firms have hindered the industry in acquiring new capital, and the price cutting of timesharing services is viewed as a major business problem.

Profits on EDP services declined or held about the same in 1971, but should improve in 1972 as a result of better capacity utilization.

Components outlook varied

Business prospects for OEM component suppliers vary greatly depending on the particular use of the product. Some companies estimate that their growth will be as high as 20-30% next year, but semiconductor suppliers estimate 5-8%, depending on mainframe manufacturers' orders for integrated circuits. Based on backlog increases, minicomputer-related products are expected to rise 25-30% and those related to terminals in remote-batch processing systems about 20%. The bright spots in the OEM industry are minicomputer tape and disk drives. In general, suppliers of these anticipate growth with the upswing in the economy and the associated increase in capital and research spending. Several manufacturers report that samples sent out in July have already turned into firm orders.

Much the same as the minicomputer manufacturers, components suppliers expect profit margins to improve as total production levels go up. In addition, many of their products are labor intensive and will thus benefit from wage controls. On the other hand, prices are expected to remain stable after steady declines during the recent past. Capital for expansion, however, will continue to be difficult to obtain because the semiconductor business is both highly competitive and cyclical in nature.

The bright spots abroad are much the same as those at home. Of all the OEM component products, only small tape and disk drives for minicomputers are expected to be shipped in any quantity to the rapidly growing European market.

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Summary

Based on this survey of FJCC exhibitors, the atmosphere in the marketplace appears to be one of "cautious optimism" rather than "optimistic caution." Few if any of those interviewed reported lingering effects of recession psychology. It should be remembered, however, that a very significant portion of the EDP marketplace -- mainframe manufacturers -- were not included in this survey. EDP/IR will be reporting its preliminary estimates for major manufacturers, and for all industry sectors, during December.

PEOPLE UNDERSTAND MORE ABOUT COMPUTERS THAN YOU MIGHT THINK

The average man-on-the-street may not be so hoodwinked by the computer mystique as many people in the computer business might want to think. At least that's one conclusion that can be made from the answers collected in a national attitude survey conducted during August by AFIPS and Time Magazine. Results were released at the Fall Joint Computer Conference. They were appropriate for the FJCC theme -- Computers and the Quality of Life.

The study included 1001 people selected from a national probability sample of households with telephones. There were no other restrictions and the distribution of respondents closely parallels the distribution of population in "the coterminus United States." Apparently the requirement of telephone ownership doesn't distort the sample much; 7% of the respondents were unemployed.

Job involvement

The number of people who think they have been around computers is amazingly high. In fact, almost half the sample reported that at one time or another they have had a job that required some contact with a computer -- either directly or indirectly -- such as receiving or giving information that a computer had something to do with. But the portion of respondents who know how a computer works seems high. Of the respondees:

49% once had a job requiring contact with a computer;
30% currently have a job requiring contact with a computer;
15% have a job that requires some knowledge of how a computer system works;
14% once had a job requiring working directly with computers;
7% currently have a job that requires working directly with computers.

This last figure seems high to EDP/IR. Computer industry revenues in the U. S. are currently running at about 1.4% of Gross National Product. Adding salaries paid to staff at computer installations and employees of companies in the industry could bring this total to 3.5%. Thus, many more people than can be accounted for from an industry standpoint seem to think they work with computers.

Computer problems

Only 34% of the sample have had problems caused by a computer. This percentage doesn't vary too much by type of person, although it is highest (42%) among those with a college education, and almost as high (40%) among respondents who report an income of $10,000 or more. Men report a few more problems than women.

A related question probes the difficulty in getting a company to correct a computerized bill. Only 24% of the people had any problems correcting a bill.

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Interestingly, 71% of these people believe that the computer personnel (rather than the computer) are fault. Furthermore, 77% of all people in the sample believe that companies frequently blame computers for mistakes really made by their own people.

Other common beliefs

One interesting question involved the reading of six statements about computers. The respondents were asked to rate each statement from 1 to 10, using a number closer to 10 when they thought a description described the nature or function of a computer. Below are the six statements, with the percentage of respondents who rated the statement 8 or above. The statements were read in a different order from that shown. (The last statement, in fact, was read first.)

An electronic device for storing information	72%
An automatic electronic machine for performing calculations	69
A super fast adding machine	61
An accounting machine used for business purposes	57
An electronic device for controlling factory equipment	44
An electronic brain or "thinking machine"	39

The order of the statements was different for only one group -- those 50 years of age or older. They ranked the second statement slightly ahead of the first. The range of answers, however, varied most in two categories: Those with college educations and those under 35. In these two groups, the first statement received 79% and 75% weightings, respectively; the last statement, 35% and 36%.

Computers in government: In general, the study results show "the public believes government should increase the use of computers in a number of areas, that such use will make government more effective, and that there will, and should be, increasing governmental involvement in the way in which computers are used.

"Approximately 57% feel that the government will determine what computers can or cannot be used for, and 61% believe the government is presently concerned about regulating the use of computers. In addition, 84% believe government should be concerned about such regulation."

Computers and privacy: There is major concern about the use of large computerized information files. Of those surveyed, 38% believe computers represent a real threat to people's privacy; 62% are concerned that some large organizations keep information about millions of people. In addition, 53% believe computerized information files might be used to destroy individual freedoms; 58% feel computers will be used in the future to keep people under surveillance; 42% believe there is no way to find out whether information about you stored in a computer is accurate.

So what???

The survey, by necessity, was quite general; it probably poses more questions than it answers. But AFIPS believes "this study is the most comprehensive one ever carried out on a national scale. The results, while positive, reveal several major areas of public concern." Researchers hope the results will lead to more study.

Copies of the full report, "A National Survey of the Public's Attitudes Towards Computers," can be obtained at $5.00 each from AFIPS, 210 Summit Avenue, Montvale, New Jersey 97645 or the Research Department, Time Magazine, Time & Life Building, Rockefeller Center, New York, N.Y. 10020.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" DECEMBER 17,1971 • VOL.7,NO.3 P.J.McGOVERN,EDITOR

International review

NEED FOR CONSOLIDATION MAY EVENTUALLY OUTWEIGH DESIRE FOR NATIONALISM ABROAD; RECESSION AND COMMON MARKET CHANGES INDICATE SLOWER SHORT-TERM GROWTH

As 1971 draws to a close, the devalued dollar is probably uppermost in the minds of most U.S. computer companies. To many of them -- especially IBM -- the bookkeeping profit this brings may well be just as important as the real business increases chalked up this year. And over the next few years -- as the U.S. business and computer replacement cycles pick up -- the international marketplace may not provide the explosive growth of the 1960s. But it is extremely important.

By either numbers or dollars, U.S.-based manufacturers account for about 75% of all computers outside the U.S. (page 5). And so long as nationalism prevails in the rest of the world very little -- even Britain's entry into the Common Market -- can change this balance of power. At present, there are signs of consolidation within countries, and the first hint of agreement across the ocean:

- Germany's Nixdorf Computer and AEG-Telefunken teamed up recently to form Telefunken Computer GMBH. With an aggressive marketing force but only tiny and large computers, this joint venture may provide an alternative for Siemens, now that it has been abandoned by RCA. Indeed, Siemens will probably join this group or fade away.

- Control Data and CII, the French computer company, have a preliminary agreement to develop a common mainframe, in the medium system class. This agreement is the result of other cooperative programs during the past two years, including participation along with ICL in Multinational Data Corp.'s efforts to establish product standards and interfaces.

- Japanese manufacturers, with complete government cooperation, are busy with their plan to consolidate computer production around three companies -- Nippon Electric, Fujitsu, and Hitachi -- that compete domestically but cooperate to present a solid front to the rest of the world.

The Japanese marketplace was carefully examined in a previous issue (EDP/IR Sept.15,1971), so only yearend figures are presented here. In this issue, we examine the European manufacturers and the prospects for U.S. companies in the international marketplace. In addition to on-the-scene reports from our U.S. staff, EDP/IR has included analysis from editors of EDP Europa Report, published in London by IDC Europa Ltd. They were in the U.S. recently for FJCC and yearend talks.

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ESTIMATED WORLDWIDE INSTALLATIONS OF GENERAL-PURPOSE AND DEDICATED-APPLICATION COMPUTERS AT YEAREND 1971; COMPARISON OF COMPUTERS IN USE TO GNP AND POPULATION OF 20 TOP NATIONS

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Country	No. CPU	% Total	$M Value	% Total	Cum. % By $M	$B GNP (1969)	%-EDP/ GNP	$K GNP/ Capita	Population (1969-Mil.)	No. CPU/ M People
USA	84,600	59.4	28,900	60.8	60.8	932	3.08	4.61	202	417
W. Germany	7,800	5.5	2,890	6.1	66.9	165	1.75	2.69	61.2	128
Japan	8,680	6.1	2,860	6.0	72.9	174	1.64	1.66	105	83
UK	7,600	5.3	2,475	5.2	78.1	93	2.63	1.68	55.5	137
France	6,700	4.7	2,150	4.5	82.6	130	1.65	2.55	51.0	131
USSR	5,500	3.9	1,460	3.1	85.7	260	0.56	1.08	241	23
Canada	3,800	2.7	1,295	2.7	88.4	79	1.65	3.65	21.5	177
Italy	3,300	2.3	1,040	2.2	90.6	82	1.26	1.55	53.1	62
Netherlands	1,680	1.2	530	1.1	91.7	29	1.85	2.21	12.9	130
Australia	1,340	0.9	415	0.9	92.6	30	1.40	2.37	12.5	107
Sweden	800	0.6	405	0.9	93.5	28	1.43	3.53	8.0	100
Belgium	1,050	0.7	355	0.7	94.2	23	1.56	2.36	9.7	108
Switzerland	755	0.5	345	0.7	94.9	19	1.83	3.03	6.2	125
Spain	720	0.5	255	0.5	95.4	29	0.87	0.85	34.1	21
Brazil	730	0.5	250	0.5	95.9	23	1.07	0.25	92.3	8
Denmark	390	0.3	175	0.4	96.3	14	1.22	2.94	4.9	80
S. Africa	480	0.4	145	0.3	96.6	7	2.06	0.36	19.6	24
Mexico	360	0.3	130	0.3	96.6	8	1.44	0.18	48.9	7
Finland	255	0.2	105	0.2	97.1	9	1.12	1.95	4.7	54
Norway	270	0.2	100	0.2	97.3	11	0.93	2.77	3.9	69
Subtotal	136,830		46,280			2145	2.15	2.05	1048	130
Others	5,570	3.8	1,220	2.7	100.0	438	.34	0.17	2492	2
TOTAL	142,400		47,500			2583	1.85	0.73	3540	40

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The recessionary wave

As seems to be customary in the global economic picture, the economic recession launched last year in the U.S. is drifting slowly across the face of Europe . . . damping in effect as it moves systematically from west to east. The UK shows signs of a slow but steady pickup during 1972, the worst having passed. Other countries still face the prospect of business slowdowns, and their captive computer manufacturers are likely to suffer along with the economy.

To U.S. manufacturers, economic problems with individual European countries have presented fewer problems. Most of the major manufacturers have substantial operations in all the major European countries; therefore, their shipment increases will be close to the 16% expected for European deliveries as a whole. This is composed of low 8% increase in the UK but moderately good figures on the Continent, where the full blast of the recession is yet to be felt. During 1972, the situation will work somewhat in reverse, and shipments should be up another 18% or so.

There are, of course, distinct variations on a country-by-country basis. And the short-term outlook doesn't suggest much stability. For one thing, the UK is almost certain to enter the Common Market within two years, and many unknowns are associated with this. And on the economic front, only the UK has really felt the full effects of the recession; Scandinavia, the Benelux countries, and possibly Germany already show signs that they will be next.

If the recession brings any cutback in spending for computers, there should be a repeat of what happened in the U.S., with certain suppliers reaping a benefit. Plug-compatible peripheral companies, for example, have made very little impact in Europe so far; the need for users to save on operating budgets would improve the appeal of independent equipment. Likewise, leasing companies might make a small amount of headway in a recession marketplace.

Major international markets

Even the most cursory glance at the geographical distribution of computers (page 2) shows that computers are concentrated in the most highly industrialized nations. About 90% of the world's computers are installed in the eight countries that account for three-fourths of the world's gross national product. A nation's population of computers, in fact, tends to parallel its GNP. There are, of course, a few major exceptions:

- The U.S. and Britain have a higher concentration of computers to GNP than normal. Interestingly, today's computer marketplace in each of these countries is more for replacement and upgrade than for expansion. A new wave of growth could occur, however, as economies improve and new applications -- especially those related to telecommunications -- are implemented.

- The USSR has a very low concentration of computers, and may well be the area of greatest computer buildup over the next few years. How much of this potential market is available to Western nations, however, will depend more on political developments than on demand. Given any chance to apply the marketing and support skills developed over the years, U.S. and European manufacturers could well provide a good share of the 15,000 computers Russia expects to install during the next few years.

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- China is still very much a mystery, even to the British who trade with her. Observors point out that the country must have some computers for use in atomic and missile work. But the extent of computer use is not known, and prospects for market potential would have to be moved to the 1975-to-1980 time period.

Thus, as is so often the case, tomorrow's major markets are those that are best today. The Japanese marketplace has been covered separately; here is a rundown on the situation in the major European markets. The specifics do vary somewhat country-by-country, but there seem to be more general similarities than observers on the scene sometimes care to admit.

The United Kingdom, as mentioned above, is basically a replacement or upgrade market with growing interest in communications and on-line processing. With 137 computers per million people, the UK is the most highly "computerized" country outside the U.S. Any Russian claims notwithstanding, the UK is the country where, along with the U.S., the early use of computers was pioneered; the users there are highly sophisticated.

Despite this sophistication, however the use of independent peripheral equipment hasn't caught on the way it has in the U.S. This is because of the marketplace. IBM has less than half the computers installed and ICL -- the dominant national supplier -- actively discourages the use of "foreign" attachments. Its newer computers are purposely not compatible with IBM tape and disk drives; it does not operate under antitrust regulations that confine IBM's freedom of movement in the U.S., and it actively resists other makes of equipment being added to its systems. Rental contracts state that additional charges can be made in such cases, and they often are. With such a hindrance, and with a proportionately small IBM base to work with, independent manufacturers -- for the most part -- have looked elsewhere.

West Germany is the largest computer market in Europe, and it may well have more potential than either the UK or France. There are many unsophisticated users of electronic accounting machines and plug-programmed equipment -- made by IBM, Bull, and Nixdorf -- and these represent excellent upgrade opportunities. Among the U.S. manufacturers, IBM and HIS obviously have a good chance for business. Univac, also, is strong in its own right in Germany.

Siemens, reliant as it has been on RCA technology and licences, is now left in an awkward position since Univac has acquired the RCA base in North America. It may well have to fold or cast its lot in with the new Nixdorf-AEG/Telefunken combine. This would be a natural, in fact. The new company -- Telefunken Computer -- has very large mainframes and an aggressive (Nixdorf) marketing force with a large EAM base. It lacks what Siemens has: a medium-scale line. Even if Siemens cooperates with Telefunken, there are questions as to the systems capability of the new company.

France represents one of the most promising upgrade markets in Europe, since large numbers of early Bull machines are still in use. Also, it is the most centralized European marketplace, with 70% of its data processing being done in the Paris area. France, however, continues to retain its traditional hostility toward foreign operations, and this is unlikely to soften for some time.

Despite extensive government support, CII, the domestic manufacturer, is still

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TABLE II -- DISTRIBUTION, BY MANUFACTURER, OF COMPUTERS OUTSIDE THE U. S.
(Estimated number and $ value of computers installed -- Dec. 31, 1971)
(Copyright 1971 by International Data Corporation)

Manufacturer	Number	%	$M Value	%
IBM	20,340	35.2	9,880	53.1
HIS	7,440	12.9	1,410	7.6
Univac	3,970	6.9	1,050	5.6
RCA	70	0.1	50	0.3
CDC	725	1.3	620	3.4
Burroughs	1,020	1.8	485	2.6
NCR	3,510	6.1	385	2.1
DEC	3,030	5.2	120	0.6
Other American Mnfr.	2,095	3.5	270	1.4
U.S. Based Mnfr. Subtotal	42,200	73.0	14,270	76.7
ICL	4,240	7.3	1,190	6.4
Siemens	860	1.5	390	2.1
CII	335	0.6	65	0.3
Philips/NVE	795	1.4	105	0.6
AEG/Telefunken	90	0.2	65	0.3
Other European Mnfr.	680	1.1	125	0.7
European Mnfr. Subtotal	7,000	12.1	1,940	10.4
Fujitsu	2,130	3.7	515	2.8
Nippon Electric	1,685	2.9	419	2.2
Hitachi	905	1.6	365	2.0
Toshiba	660	1.2	155	0.8
Oki Electric	525	0.9	115	0.6
Other Japanese Mnfr.	195	0.3	55	0.3
Japanese Mnfr. Subtotal	6,100	10.6	1,615	8.7
Other Mfrs.	2,500	4.3	775	4.2
INTERNATIONAL TOTAL	57,800	100.0	18,600	100.0

weak. It still has to prove its ability to either manufacturer or market successfully. And as the third and weakest member of Multinational Data, CII looks likely to be increasingly dependent on the results of the cooperative venture . . . or bilateral arrangements growing from it. CII's current product line is manufactured under license from XDS, and it is being impacted by the direct marketing, started very recently by XDS in Continental Europe, of Sigma series units that supercede the Sigma 2 and 7. Outside the protected market among government- its technology licensor -- offering a more advanced product and a larger support organization -- in non-French markets.

The French company is obviously looking toward the new products being developed in conjunction with Control Data. There are serious doubts, however whether CII has the ability or even the inclination to market the larger models from this venture.

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ICL talks of a "second force"

Last spring in Atlantic City, ICL had a chance to present its case when Sir John Wall, its chairman, turned his assigned keynote theme of "Responsibility" into an appeal for standardization . . . of the ICL variety. Some of the statements:

> *What we surely need are world standards which look ahead and are not de facto standards imposed by the dominant supplier.*
>
> *Plug-to-plug peripherals are just the beginning of standard interface arrangements so that peripheral controllers, front end processors and, indeed, complete systems, can have a standard interface. Thus the customer is free to buy a complete system from any manufacturer, or any part of that system -- hardware or software -- from any number of suppliers.*
>
> *Real freedom of choice, which is what competition is about anyway, must come from genuine international standards such as standard interfaces.*

In leading up to this statement, Sir John had described the U.S. computer industry as one of very few in which "widespread dissatisfaction by the customer" is accompanied by "equally widespread willingness to continue to take more punishment." He pointed out that users need protection of their investment in information systems, not "dramatic" improvements in performance before they have even had the opportunity to get a fair return on previous investment.

In a very sincere statement of personal belief, Sir John expressed his view that technology should not be used as an instrument of foreign policy, but rather should be used to increase the wealth and happiness of mankind and, as such, be made widely available. Many listeners wondered at such altruistic idealism.

Pressed for a little more reality, ICL's leadership state a very firm belief that, through standardization, at least a second force can be created in the worldwide computer industry. Even if IBM elects to adopt its own course, they argue, there is no reason why the other manufacturers can't adopt standards that would give users an alternative. And Multinational Data (EDP/IR Apr.30,1971) -- "The Club" in IBM's terminology -- is cited as a step in the right direction. Even if this doesn't evolve into a joint marketing arrangement, the British spokesmen point out, it will at least allow each of the participants to offer a wider range of products . . . or their customers to have a more diverse shopping list.

While it is striving for standards, ICL says it doesn't expect to sit back quietly and wait. It has its work cut out for it. During the next four years, the British company expects to double its present size, concentrating on both developed and undeveloped markets. It sees great potential in offering virtually "turn-key" computer systems to users in the developing nations. Also, it expects to make more inroads into the European market now that Common Market acceptance is assured. Finally, it plans to consolidate its position in other countries such as Australia and New Zealand, where minority ownership of local marketing and software ICL affiliates is expected to bring market dominance.

Once this is accomplished, ICL thinks that it can look toward the U.S. market. This is about five years away, however, and could come as the result of its cooperation with one or more of the U.S. mainframers. An initial move in this direction, however, recently was turned down when ICL had a chance to purchase Consolidated Computers. It has apparently opted not to use key entry as its U.S. entry.

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U.S. dominance continues

As the accompaning tables show (page 5), U.S. companies have about three-fourths the international marketplace, and this stiuation holds fairly true in all European countries except for the United Kingdom. There are variations by country and certain strongholds for specific U.S. manufacturers; but in general, IBM has its 70% share of the U.S. business.

The dollar devaluation will not have nearly the effect that might be imagined. Only about one-fourth of today's international computer shipments by U.S.-based manufacturers are actually built in the U.S., and this is mostly large mainframes that have little foreign competition. CDC will be hurt if its exports take a dive, but it has good acceptance in Europe, so will probably gain from devaluation.

The first 7600 outside the U.S. was installed at the University of Manchester, in England, this fall. In addition to the expected scientific installations, CDC has been making inroads into banks, especially in Germany. There, the more quantitative, management-science approach of the German businessman is bringing business to the scientific/engineering orientation that Control Data presents.

During the beginning recession in Europe, the large machine business in general has continued strong, supported as it is by continuing government grants and large university requirements. Order levels for the Univac 1110 and 1106 are holding well. And IBM's 370/155 and 370/165, after a slow start, are beginning to be ordered in larger numbers. Also, very small systems are finding a strong market -- both from new users making their first commitment to data processing as well as from small-to-medium users who are downgrading their commitment somewhat or from large data communication users who are employing these systems as terminals.

Burroughs finally seems to have solved the problems with its large banking installations in the UK, and is picking up new business. NCR was heavily affected by the post-decimalization slump in the UK, and had to lay off nearly 2,000 staff from its Scottish accounting machine plants. NCR, however, is working toward another banner year from its overseas business. The company reports more bookings during November than in any previous single month, and that orders for 1971 will be up 10% to 15% over the 1970 level abroad.

Reports are that Honeywell still is having some difficulty convincing people that it has effectively pulled together all its parts; many users, thus, have adopted a "wait-and-see" attitude, but this is expected to disappear slowly during 1972. As a result, HIS is expected to have an increasingly strong position, particularly in France where even strong government support is unlikely to help CII.

Time to paint computers red?

As trade barriers are lifted, the Western front is beginning to feel a demand for computers from Communist countries. IBM last month announced that it had sold the 360/50 displayed at the Leningrad Trade Show in October. And next April, several major manufacturers -- Burroughs, CDC, DEC, Honeywell, and Univac -- plus some peripheral companies will have booths at the computer and data equipment exhibition in Moscow.

And the Soviet Union seems hot for computers. Its current 5-year plan (cover-

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ing 1971-1975) calls for 12,000 to 15,000 Ryad third-generation computers to be produced. Such production is considered unlikely, but the figure -- released in a rare bit of openness about planning -- is taken to be an estimate of demand. The accent in Russia seems to be for linking computers to production processes. Already, however, engineers from the Soviet Union are writing articles about the problems associated with the successful installation and operation of industrial production control systems. So Western knowhow will be valuable.

The desire and need for computers is also great in Eastern Europe. EDP/IR observers at the recent IFIPS '71 Congress in Yugoslavia found that most Eastern European representatives and salesmen of U.S. computer makers were inundated with potential customers who would like to order Western built computers. They are frustrated, however, with the difficulties of getting approvals for importation or by the procedures for obtaining internal approval for their acquisition.

A typical experience is first a four-to-six-month wait before the U.S. Department of Commerce's Export Control Board -- or the corresponding Nato Coordinating Committee -- approves the required license. Then, six to nine months more are required for the customer request to be approved by the central planning council of the country involved. Finally, there must be approval by the country's currency control committee. It's easy to see, therefore, that patience is more than a virtue in marketing to Eastern Europe . . . it's a necessity.

One of the biggest barriers in trade with the East, in fact, is the necessity for easy credit terms. ICL among the European companies has been active in marketing in both Eastern Europe and the Soviet Union because it has government guarantees of trade credits. This financial obstacle will likely block private shipments of System/360s (by third-party leasing companies, for example) to the Soviet bloc. IBM, of course, has sufficient financial strength to cope with the hard currency problem and set up operations in Eastern Europe if this were allowed. Also, Honeywell, Univac, and Siemens have placed equipment in Eastern Europe and the success of such sales puts them in a good position for future orders.

Stiff medicine for the Europeans

The outlook for European computer manufacturers -- with their heavy emphasis on nationalism -- is not the best. Short of true consolidation, which is unlikely in the near future, government-backed projects and some "second force" business is all that can be expected. U.S. companies in Europe are major employers by any standard, and they are gradually being accepted as part of the local picture.

Without consolidation, the future of the European computer companies is questionable. And the pending entry of the UK into the European Economic Community will probably help U.S.-based manufacturers (who manufacture in the UK or on the Continent and therefore can expect lower transfer taxes) more than it will European companies or ICL. Nationalism will have to be sacrificed.

The total amount of R&D funds available to all European-owned companies is about $90 million . . . far less than the $400 million or so invested annually by IBM and not even as much as U.S. companies such as HIS. Moreover, American companies operating on a worldwide basis have such a volume of production that they can ship more cheaply into Europe -- even with import taxes -- than the native companies can produce. EDP/IR thinks it will only be a matter of time before European companies wake up and realize they can't survive in their present state.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" DECEMBER 24,1971 • VOL.7,NO.4 P.J.McGOVERN,EDITOR

Questions and answers

1971 COMPUTER INDUSTRY DEVELOPMENTS POSE QUESTIONS ABOUT GROWTH, MARKET SATURATION, AND PROFITABILITY FOR EDP SUPPLIERS

The outlook for the U.S. economy looks brighter; the dollar, though cheaper, is hopefully healthier; there's finally some sparkle in the stock market. Thus, as people pause and close out yearend accounts, many are inclined to say: "Thank God 1971 is over; onward and upward in 1972!"

But a quick dismissal of 1971 isn't fair. This past year has been, in one sense, the most important in the short history of the computer industry. It was the year when most people, if they hadn't found out before, became acutely aware that they are in a business, albeit a somewhat different one. Developments during the past year have raised many fundamental questions about the basic demand for EDP products, the possibility of market saturation, and the prospects for profitability in the face of stiffer competition.

These questions are being asked by security analysts, economists, top-level corporate executives, and government officials -- many of whom maintain a dialog with the consulting staff of the International Data Corporation, publisher of EDP Industry Report. IDC clients include some of the largest suppliers in the industry, as well as organizations that provide financing for the industry, and investors. In many cases, concepts and trends are considered more important than new sets of statistics.

EDP/IR has studied the queries that come into IDC, and organized some of the most important questions and answers in this issue. The topics here are those of most concern to major industry participants. In many cases, various aspects of a particular question have been discussed during the last year. When this is the case, references are given so the reader can look up more detailed market data or analysis (see page 8). To save space, reference is made by volume and number -- this issue, for example, would be cited as 7-4.

QUESTION: Have computers been oversold?

ANSWER: It depends on the computer manufacturer involved and the type of user. Unquestionably, some of IBM's growth during the 1960s came from overzealous marketing by salesmen who continually led unsophisticated customers, like sheep, to the land of higher equipment rentals. When a user had a problem in data processing,

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extra hardware was deemed the answer; and in many cases, inexperienced or undertrained DP managers took the salesman's advice. It was the safest way out.

Other computer suppliers -- usually competing against IBM -- priced their equipment some 15% to 20% below the IBM equivalent, or bid more economical configurations. As a result, most of the overcapacity exposed by the recent recession applied to IBM users. Many of them, when pressed by budget limitations, were able to use their equipment more efficiently and thereby hold expenses down. In many cases, it must be pointed out, efficiencies were achieved because IBM improved its own software or operating systems.

QUESTION: How rapidly is the demand for computing power expanding?

ANSWER: Computer users in the United States have some $29 billion worth of computing equipment, figured at shipment price. During the next three to five years, EDP/IR forecasts this installed base will increase 11% to 14% each year, with the demand for new equipment coming almost equally from three areas:

- As the economy recovers, overall business levels will grow and there will be more paperwork to process.

- Existing applications will be expanded to on-line operation, and this will require additional equipment: terminals, interconnection devices, and more mass storage (6-24).

- According to IDC's field research, major new applications are still scheduled by EDP departments of most large corporations. Many of these applications -- such as on-line transaction accounting systems and inventory control -- will include data communications networks. The cost justifications for changing from current operating methods include reduced labor costs, lower inventory levels, greater control of information, and the like (6-15,17,19).

QUESTION: What about new users?

ANSWER: New users -- previously handling their accounting and information processing needs with manual methods, punch-card accounting machines, or service bureaus -- currently account for 15% to 20% of U.S. shipments (6-18,24). This percentage, as well as the actual dollar amount, is expected to decrease. There are thousands of potential new users, but typically these smaller business, educational, and government operations only start with a small computer such as IBM's System/3, costing $70,000. This is a far smaller shipment opportunity than that of the late 1960s, when the new user could well have installed a 360/30 or its equivalent worth about $500,000.

Once a new user joins the existing base, however, his upgrade patterns are encouraging. During the first year or so, the new user may add from 20% to 30% additional equipment, and within two to three more years he is a potential candidate for upgrade to a more costly system.

QUESTION: Doesn't this indicate a maturing marketplace?

ANSWER: Yes. EDP/IR's analysis shows slower growth in the U.S. installed base. But this in no way means that mainframe companies don't have the opportunity to add to their current rental base and build its value through additional appli-

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cations, attractive new equipment offerings, improved software, and more communications orientation. Once a user has chosen a mainframe manufacturer, there is little "brand switching" (6-13). Thus, EDP/IR thinks growth for most mainframers will depend largely on its own base of users. This is the fundamental reason for the success of HIS; it highlights the strategy behind Univac's acquisition of the RCA customer base (6-23;7-1,2).

QUESTION: Why has IBM had such a high rate of "discontinuances"?

ANSWER: Computer equipment being taken off rent and returned to IBM -- officially called "discontinuances" -- has been caused by several major factors. One factor often cited -- corporate closures or bankruptcies by users -- indeed exists, but accounts for only a very small percentage of discontinuances.

- Some users, made more cost conscious during the recession, have replaced IBM rental equipment with third-party leased 360s or independent peripheral tape and disk drives.

- Corporate consolidation of EDP activities have resulted in the centralization of computers at company headquarters and/or replacement of branch plant computers with remote terminals.

- Improvements in software and customer sophistication in EDP management have accounted for actual discontinuances as well as delays in upgrades in equipment expansion.

- IBM's own System/370, representing a very economical price/performance upgrade for 360 users, allows some users to reduce their number of CPUs while generating relatively few current new rental dollars.

QUESTION: Will an influx of used computers detract significantly from new computer shipments?

ANSWER: So far, the supply of "previously owned equipment" has been very small, and is composed largely of second-generation IBM 1400 and 7000 series equipment. Only about 100 or so used System/360s have actually changed hands. Users own approximately 20% of the installed 360 base in the U.S., or about $2.5 billion. But 360 purchases were usually justified on the basis of five-to-eight year payouts, so the vast majority of purchased equipment will be kept by its initial user for the next several years. EDP/IR expects this equipment to trickle into the market -- at significantly reduced prices -- over the next five years. No other brand of equipment accounts for more than a fraction of a very fragmented used equipment market in which broker and direct user sales totaled only $50 million to $75 million of turnover during 1971.

QUESTION: Will the availability of third-party leased computers cut into new computer shipments?

ANSWER: Another significant portion of the System/360 base -- almost $3 billion worth at new equipment prices -- is owned by the third-party leasing companies. The owners, of course, are vigorously trying to keep this equipment on lease so they will finally generate the profit that was originally anticipated. About one-third to one-half this equipment will come up for lease renewal during 1972, and EDP/IR estimates that the vast majority of it will remain at the original user site . . . at slightly reduced rates but no additional remarketing expense (6-7).

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Very few leasing companies report much equipment in inventory (off lease), and currently they are achieving lease rates equivalent to 60% to 70% of the new equipment rentals charged by IBM. This discounting, of course, has its effect on IBM and has resulted in some discontinuances of rented IBM systems. And as rates decline during the next few years, the third-party "base" of 360s will continue to cut into IBM rentals. Such a situation is not expected to occur with System/370, however, because its higher purchase and maintenance costs make it less suitable for third-party leasing. There is some activity in long-term or full-payout 370 leases, but EDP/IR believes the volume will be only a small fraction of that generated during the 1968-1970 period.

QUESTION: Will more competitive pricing have a negative impact on mainframe revenue and earnings growth?

ANSWER: Over the years, prices in the computer industry have followed a price/performance improvement curve where, in general, a doubling in performance in new models could be had for a little less than a 50% increase in cost (Grosch's Law). It appears to EDP/IR that with the 370, IBM adopted what appears to be a more competitive pricing policy, allowing many users to move considerably upward in power over their 360 with a very small, if any, increase in cost (6-21). The exact reason for this difference is not clearly known. It may be that IBM was anticipating the vigorous competition from the independent peripheral companies; it could be that 360 did not deliver the expected power, and 370 merely brought the situation back to where it should have been. In any event, the other mainframe manufacturers have not had to reduce system prices. There is no doubt, however, that the price/performance of System/370 will be considered as the other mainframers introduce major new lines of equipment.

A very positive factor for the mainframe companies is the 2% to 6% price increases that have been approved by the Price Board. Manufacturers may actually be able to improve their margins if anticipated increases in shipment volume this year reduces unit production costs.

QUESTION: How much has competition hurt the peripheral manufacturers?

ANSWER: The independent peripheral companies, hit by IBM's price reductions and product improvements (6-2,14,21;7-2), definitely report lower margins in IDC surveys. However, many of them note that the high margins enjoyed on tape and disk drives during the past several years were "lucrative" and that now they must operate on a more traditional margin basis. In this respect, their prospects for earnings growth are certainly diminished and it is quite likely that a series of combinations and mergers will significantly reduce the number of independent peripheral manufacturers. At one time, there were 14 announced manufacturers of a IBM 2314-compatible disk drive. The market will simply not support so many suppliers, and it is probable that three or four general-purpose peripheral manufacturers will survive, along with a few specialized companies.

QUESTION: What's the outlook for the minicomputer market?

ANSWER: Minicomputer business continues strong in the U.S., with only a slight pause in growth caused by the recession (6-16). Most of the major companies report increased backlogs -- stemming in part from the investment tax credit -- and some state their order levels picked up in advance of the price freeze, with small-lot deliveries from earlier this year now turning into substantial OEM contracts. The end-user market for scientific and industrial research applications

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was affected by the recession, but continues to show some growth because it is still very unsaturated. Two areas quite important to the future of mini manufacturers -- data communications and industrial automation -- have been strong right through the recession and have an even better outlook.

Finally -- and most important to the success of this market -- price competition appears to have abated somewhat. EDP/IR believes that the sharp drop in average system prices has bottomed out or slowed considerably as manufacturers add additional peripheral equipment to the basic processor. The highly publicized competition for a "naked mini" applies to stripped down models and large OEM deals. Indeed, powerful minicomputers are now available for less than $3000, but this buys only a component assembly and does not reflect overall industry pricing for a useful small computer.

The overseas market for minicomputers may slow somewhat in 1972 if recessions become serious in Germany and France. Many manufacturers interviewed by EDP/IR do not expect their foreign market growth to be as rapid in 1972 as it was in 1970 and 1971. In some areas, however -- communications in particular -- this means healthy growth rather than extravagant upsurges.

QUESTION: Is the foreign market slowing down?

ANSWER: In terms of percentages, the foreign market is indeed slowing down, because it's installed base is becoming significant -- $16.5 billion at yearend 1971. Growth in shipments by U.S.-based mainframe manufacturers to the international market grew about 18% in 1971, with the installed base increasing some 15% to 18% (7-3). During the next several years, shipments will increase at the 15% to 18% rate -- paralleling that expected in the U.S. Encouragingly, retirements are expected to be lower and the dollar total of shipments to new users will accelerate; thus, the installed base will continue to grow at a rate more rapid than in the U.S. The level of saturation in other world markets -- even in the three major countries of Western Europe -- is much lower than in the U.S.

QUESTION: Is the Soviet bloc a realistic new market opportunity for U.S.-based computer manufacturers?

ANSWER: The Eastern European countries and the Soviet Union are potential markets for all Western computer companies. They are difficult to tap, however, because of technical export restrictions and the problem of financing exports to these countries (7-3). The British government provides some financial support for exports to the Soviet bloc, and it may be that the U.S. Government will adopt this attitude since it has recently begun to provide trade credits to steel equipment manufacturers, for example, in Rumania.

It is probably not economical for American companies -- either mainframe manufacturers or leasors -- to ship existing equipment to Eastern Europe and expect a profit. In addition to shipping costs and the necessary voltage conversion, the used equipment will encounter significant tariffs, border taxes, sale and use taxes. These would be hard to recover during the practical economic life of the equipment.

QUESTION: Can nationalistic policies hinder U.S.-based manufacturers?

ANSWER: In Europe itself, the European-based companies have been increasing their market share by a tiny percentage each year in face of the American-owned manufacturers. On the other hand, U.S. companies operating in Europe control about

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80% of the market, and will probably maintain close to that share into the foreseeable future. ICL is the only company in Europe to have a significant market share in even its home market; in the UK, ICL has about 40% of the installed base, to IBM's 35% share. However, ICL is financially weak, and while receiving token aid from the government, it has made very modest progress in Europe or elsewhere outside the old Commonwealth. CII, the French company, Philips in Holland, Siemens and Telefunken Computer in Germany, and a few other small manufacturers will probably not seriously damage American market shares in the near future (7-3).

It is important to understand that American manufacturers are important employers in every European nation, and governments are loathe to damage payrolls. While politicians may rant against "the American challenge," IBM remains an employer of 25,000 workers in Germany, Honeywell an important employer in France and the UK, etc.

QUESTION: What potential does Japan have as a market? As a world computer supplier outside Japan?

ANSWER: With the exception of IBM and NCR, American companies operate in Japan through licensees. The Japanese government has been encouraging their international companies to produce Japanese designs, and has funded development of large-scale computer systems. Current investment and trade barriers make it very difficult for American manufacturers to operate directly in Japan, or ship independent peripheral equipment into the Japanese market. The monetary situation and anti-U.S. attitudes will probably make any new marketing in Japan uncertain for quite some time (6-22).

Japanese manufacturers have made little penetration of markets outside Japan, but might be expected to show up -- at least in Europe -- during the next several years. However, any serious impact on American companies either outside the U.S. or at home is at least several years off.

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Three major cases against IBM

INSPECTIONS AND DEPOSITIONS CONTINUE AS FIRST ANTITRUST SUIT NEARS TRIAL

Three years ago, a booming computer industry was finishing up its best year to date when Control Data filed its antitrust suit against IBM (EDP/IR Dec.23,1968). This was followed by a rash of other suits -- some directly related and some quite incidental to the central antitrust problem. And as more were filed, some began to be settled out of court.

It looks, now, that the cases are about to be back in the news, and that some visible progress will begin. EDP/IR has been following the situation since it began, and for this issue we asked the International Data Corporation's legal department to prepare a rundown on the three major suits still pending (below). All are civil complaints brought under various sections of the Sherman Act. Here is a synopsis of each one -- what it involves and where it stands:

The United States vs. IBM

SUBSTANCE OF COMPLAINT: IBM has monopolized the general purpose computer market by "bundling" the price of hardware, software, and support services; by pricing

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new computers at unusually low profit levels; by announcing new computer models when it knew it was unlikely to be able to deliver such models within the announced time; and by granting discriminatory price discounts to educational institutions.

STATUS: Inspection of IBM documents is just beginning. Depositions of IBM officers and third parties by Justice Department attorneys will probably commence early in 1972 and will take a minimum of 24 months. Settlement by a consent decree or trial should not be expected before mid-1974.

RELIEF SOUGHT: Injunction of continuing violations; separate pricing (for sale and lease) of general purpose computers, software, peripheral equipment, and customer support; prohibition of discriminatory pricing to inhibit entry or growth of competitors; prohibition of production of hardware not likely to result in returns reasonably related to returns from other hardware sold or leased by IBM; prohibition of premature announcement of new hardware or software; and divestiture or reorganization of IBM as necessary to restore competitive conditions to the general purpose computer industry.

Control Data Corporation vs. IBM

SUBSTANCE OF COMPLAINT: IBM has monopolized the computer industry through "exclusionary practices" including, among other things, premature announcement and other misrepresentation of new hardware and software; discriminatory pricing in geographic or industrial markets in which competition is more intense; packaged or "bundled" pricing of certain products and services; establishment of technical standards to inhibit use of competing general purpose computers or independently manufactured peripheral equipment; encouragement of leasing rather than purchase of computers by unreasonably low lease rates; utilization of reciprocal buying power to influence computer procurement of customers; illegal tied marketing with the Service Bureau Corporation; violations of the 1956 Consent Decree by entering into timesharing services; and monopolistic exploitation of patents.

STATUS: IBM and Control Data have substantially concluded examination of documents and are commencing deposition of officers, employees, and third parties. Depositions are expected to continue throughout 1972 and trial or settlement is unlikely until the spring of 1973, at the earliest. However, trial of the Greyhound case in the spring of 1972 (below) might accelerate CDC's schedule.

RELIEF SOUGHT: Injunction of all exclusionary or other practices in violation of the antitrust laws; triple damages recently estimated by Control Data to exceed $7 billion; and dissolution or divestiture of properties of IBM as necessary to prevent further violations.

Greyhound Computer Corporation vs. IBM

SUBSTANCE OF COMPLAINT: IBM has exercised its substantial powers in the general purpose computer industry to exclude leasing companies as competitors by adjusting prices, services, and depreciation policies to render third-party leasing of IBM equipment unprofitable. These practices include, among other things: pricing equipment at unreasonably high levels in relation to IBM rental rates, pricing of new equipment at original price levels regardless of actual obsolescense of such equipment due to the approach of the end of a product life cycle, abolition of free support and software for which the plaintiff had paid a bundled

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price at the time of purchase of IBM equipment, and reduction of IBM lease rates after sale of more than $150 million of equipment to the plaintiff.

STATUS: Greyhound and IBM have substantially concluded examination of documents and are well into deposition of officers, employees, and third parties. The court has ordered all examination of documents and depositions to be concluded by February 1, 1972, and a spring trial date is expected. Trial is unlikely to take more than two or three months, so a decision is likely by mid-1972.

RELIEF SOUGHT: Injunction of illegal practices of IBM and treble damages.

Issues of EDP Industry Report referenced in this "Q&A" review have more detail on topics of major importance. If you missed any of the issues, or desire extra copies for associates, check the list below:

Issue	Topic	Check List
7/3	International market outlook	[ ]
7/2	Univac acquires RCA customer base	[ ]
7/1	Mainframe upgrades announced by Burroughs, Univac	[ ]
6/24	Expanded capabilities for small IBM systems	[ ]
6/23	RCA abandons mainframe business	[ ]
6/22	Japanese market outlook; analysis of Japanese suppliers	[ ]
6/21	Users opt for IBM fixed-term leases; IBM shuffles prices	[ ]
6/19	Data communications market set for 40% to 50% growth	[ ]
6/18	Small business computer market holds large potential	[ ]
6/16	Minicomputer market moving into new applications	[ ]
6/15	Software and application market outlook	[ ]
6/13	Mainframe customer loyalty patterns	[ ]
6/7	Leasing companies plan remarketing strategy for IBM 360s	[ ]
6/2	Lower-priced IBM peripherals counter independent challenge	[ ]

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JAN 3 1972

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" DECEMBER 31,1971 • VOL.7,NO.5 P.J.McGOVERN,EDITOR

At long last

MAINFRAME SHIPMENT GROWTH EXPECTED TO REBOUND IN 1972 AS 1971 ENDS WITH GROSS UP BUT NET OFF A FRACTION

Net orders booked continue to be adversely affected by a high rate of discontinuances of data processing equipment formerly installed on a rental basis. This appears to be largely due to economic conditions.

-- from October 12, 1971 report to stockholders by T.V. Learson, IBM chairman

The year, 1971, was one in which our industry felt the effects of the downturn of the economic conditions of the country, resulting in greatly increased competition. Yet, within this environment, [we] closed the year with a favorable performance. The outlook for 1972 is one of opportunity and promise.

-- part of the Holiday Message from an independent peripheral manufacturer

Offset about two years by new product introductions and the recession, computer industry shipment curves are finally back on the uptick as 1972 begins (page 3). Excess capacity in the U.S. has been absorbed (EDP/IR Dec.24,1971); user budgets are being increased for 1972; the international marketplace as a whole continues to look healthy (EDP/IR Dec.17,1971).

During the last few months, EDP Industry Report and its publisher, the International Data Corporation, have been surveying computer users and talking with mainframe manufacturers. The preliminary 1971 results are in . . . as well as the forecasts for 1972. Finally, things look good. As the charts in this issue show, shipments are headed up and the rate of retirements has stabilized. Overly simplified, two-to-three years of turmoil have been sandwiched into an otherwise stable long-term picture. Here's the way things look at yearend 1971:

- Worldwide shipments by U.S.-based manufacturers will be up about 8% in 1971 to $7.4 billion.
- Shipment increases of 17% to 19% are forecast for 1972 and 1973.
- Most important, the rate of retirements seems to have stabilized, and net additions to the installed base are expected to increase again after two years of decline in value.

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IBM sets the pace

Mainframe computer shipments during 1971 followed a much more common trend than was the case after the final tally for 1970 (EDP/IR Mar.12,1971). Setting the pace, IBM increased new-built shipments in both the U.S. and abroad . . . with gains of 7% and 16% respectively. International shipments among other U.S. mainframers all showed similar increases in the 15% to 20% range.

In the U.S., only Burroughs and Digital Equipment -- with shipment increases of about 10% each -- did better than IBM, as volume deliveries of System/370 began. The other U.S. heavies were off significantly -- in the 10% to 20% range -- and as a result the total U.S. shipments by non-IBM manufacturers was down 3% vs. 1970. This brought the total increase in U.S. shipments to only 3% over 1970.

PRELIMINARY ESTIMATE OF 1971 WORLDWIDE COMPUTER SHIPMENTS
(Values in $ million for U.S.-based manufacturers)

Company	Shipments	% of Total	1970-71 % Change
IBM	$4830	64.9%	+10%
HIS	615	8.3	0
Univac	470	6.3	+ 1
Burroughs	440	5.9	+13
NCR	290	3.9	+ 2
RCA	$ 255	3.4%	- 6%
Control Data	200	2.7	- 3
Digital Equipment	115	1.5	+13
Xerox Data Systems	55	0.7	-11
Others (incl. minicomputers)	170	2.4	+78
TOTAL	$7440	100.0%	+ 8%

The preliminary figures presented above are subject to revision, of course, as additional inputs are analyzed by IDC. Final results, as usual, will be presented in the Review and Forecast issue of EDP/IR scheduled for March, 1972 publication. It should be noted that the figures above do not include plug-compatible peripheral equipment -- shipped primarily to IBM users. Shipment levels of these products were nipped somewhat after IBM announced its fixed-term lease plan (EDP/IR Aug.31,1971), but were still up some 11% over 1970 to about $250 million.

The net/gross problem

In measuring the computer industry, one of the biggest problems is agreement on definitions. What is meant by shipments, for example?

Ever since we began publication in early 1964, EDP/IR has estimated and reported on new-built computer equipment. This includes add-on shipments such as additional core or new tape drives, but makes no provision for retirements or reshipments of equipment from one customer to another. In theory, it is the best measure of productivity during any given year.

But shipments each year are only an indication of future revenues to a manufacturer, since the computer industry is primarily a rental business. Often, when computer users "discontinue" the use of one product and replace it with a newer

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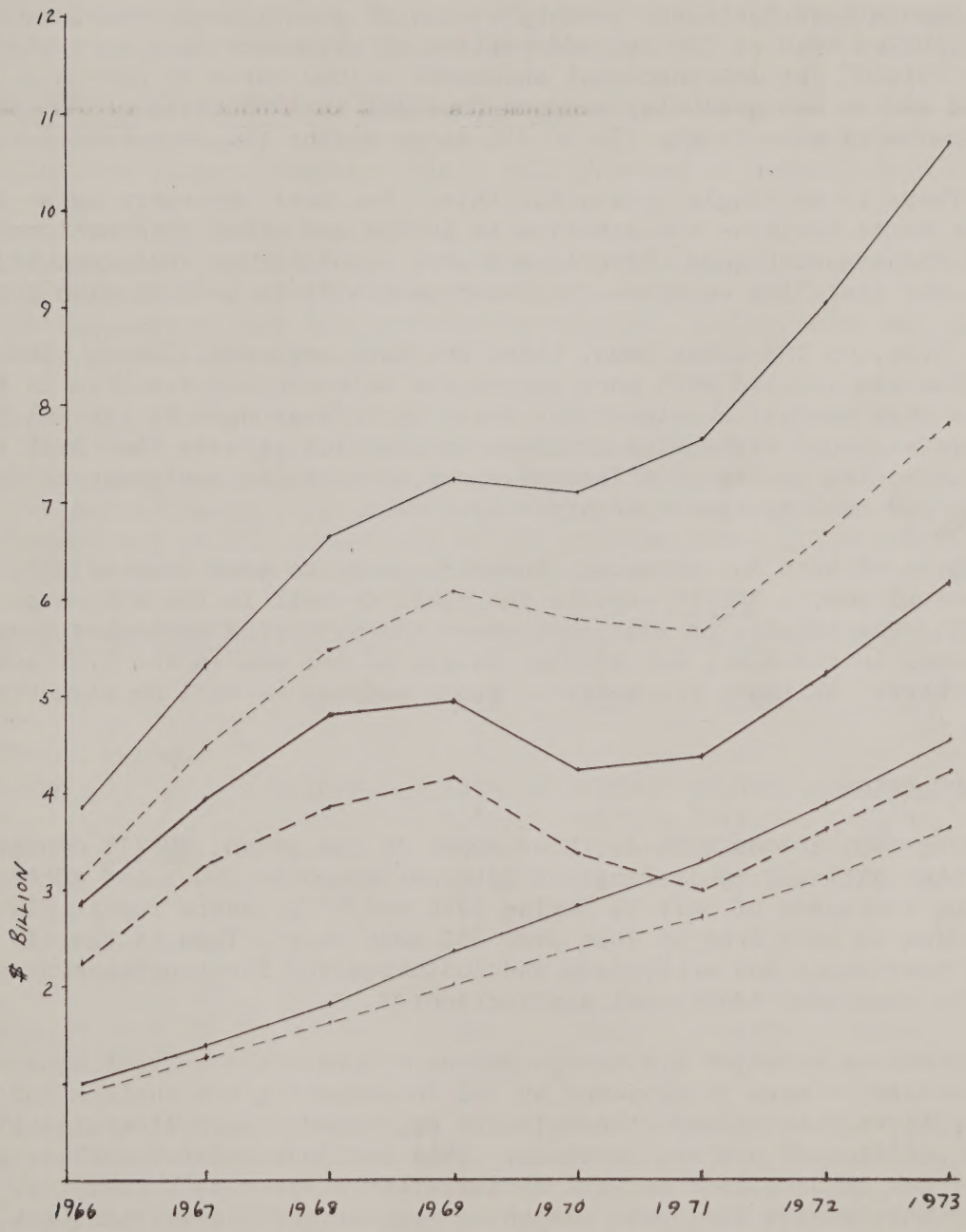
WORLDWIDE COMPUTER SHIPMENTS BY U.S.-BASED MAINFRAME MANUFACTURERS

(Copyright 1971 by International Data Corporation)

Solid lines indicate new-built shipments
Broken lines indicate net additions to base

Top line is worldwide figure
Center line is U.S. component
Bottom line is International component



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one that gives more performance per dollar, the computer manufacturer is faced with a problem. It builds new equipment, all right, but it doesn't gain a similar increment of new revenue. This can hurt severely when the older equipment hasn't been fully paid for by the user (or depreciated by the manufacturer). The effect has shown up dramatically in IBM's balance sheet the last year or so.

To give an indication of this interaction, EDP/IR prepared the graph on page 3. It explains much of the turmoil in the computer industry during the last few years, and indicates what our detailed analysis shows for the future.

The U.S. user -- gullible or grandiose?

One of the most noticeable aspects of the graph is the difference in shipment patterns in the international marketplace (at bottom) and the U.S. (center). Abroad, shipments have increased year-by-year with great consistency, and retirements have nibbled away at the net add portion of shipments on a very regular basis. The "yield" for international shipments -- the ratio of new-built shipments to net add -- has gradually dropped from 19% in 1966 to about 78% this year. This will gradually ease to the 73% to 75% range during the next few years.

Why? There is no single reason for this. But most observers agree that it reflects the basic business conservatism in Europe and other international areas. Most users, the argument goes, have looked more carefully at what computers can do and have not installed equipment at least partially to keep up with the Joneses

In the U.S., on the other hand, there has been more ebullience. This overflow of enthusiasm coupled with more aggressive salesmanship resulted in too much too soon for many users. An almost 80% yield in 1969 plunged to the 60% level in 1971 as users -- faced with budgetary restrictions for perhaps the first time in their computer-using career -- milked more out of existing equipment or sidegraded to much more powerful equipment at equivalent cost.

The degree of such fat-trimming, however, seems to have leveled off. During the next several years, EDP/IR expects the yield to hold in the 65% range projected for 1972. The result, as the graph shows clearly, will be higher levels of total shipments in the U.S., but similar levels of net add in the U.S. and international markets. Shipment increases -- gross and net -- will be slightly higher in the U.S.

Loosening the reins

In making projections such as those shown in the graph, EDP/IR depends very heavily on the continual monitoring activity performed by IDC. And after hardware spending increases of only 9% during 1970 and 1971, users report plans to increase spending in this area by just over 15% next year. This is clearly an expression of confidence and enthusiasm and indicates the first unleashing of pent-up desires to implement additional applications.

Top executives at major U.S. corporations -- where the bulk of computer spending is controlled -- were interviewed by IDC in preparing its outlook for 1972. Of all the executives interviewed, the majority expressed a very liberal attitude concerning the addition of new applications. This attitude related both to the implementation of new DP functions and the optimization of present activities. With the exception of only a very few, most companies are currently developing new software systems or packages.

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The economic squeeze of 1970-1971 did impact the computer industry; so did the product change stimulated by IBM's System/370 announcement and its relatively higher price/performance characteristics. Concurrently, some companies curtailed product development . . . and two big ones bowed out.

Now, all signs point to a period of renewed vigor in the industry. Shipments are expected to be up 19% next year, and 15% or more for several thereafter. A number of smaller companies were shaken out, and users have had a period to closely examine costs . . . some for the first time. The character of the industry has changed. It is more seasoned, more businesslike. EDP/IR as well as industry participants looks forward to this new period of reasoned growth.

DWARFS CAN'T SEEM TO RAISE SHARE OF PROFITS UP TO SHARE OF MARKET

RCA this week announced its preliminary figures for 1971, and the degree of its losses in the computer industry were reemphasized:

> Sales and profit of RCA's continuing operations advanced during 1971, but an extraordinary charge related to the company's withdrawal from the general purpose computer field will produce an overall loss for the year . . .
>
> RCA's computer decision resulted in a one-time after-tax charge of $250 million related to its withdrawal from this field. This, and the net operating loss of the discontinued operations, will produce an overall loss of about $155 million for 1971 . . .

This brings back to mind a lot of talk about the structure of the computer industry, and where the profits are among the mainframers. Working with annual reports, quarterly statements, proxy statements, internal modeling techniques, and Wall Street estimates, IDC's industry analysis department has prepared an industry revenue and profit comparison of IBM vs. the other mainframe manufacturers. Income is given on a before-tax basis:

WORLDWIDE EDP REVENUE AND PROFITS OF U.S.-BASED MAINFRAME MANUFACTURERS

	1966	1967	1968	1969	1970	1971
EDP: Total Revenue						
Non-IBM	1479	1874	2329	3032	3280	3547
IBM	2603	3562	4873	4935	5195	5400
TOTAL	4082	5436	7202	7967	8475	8947
IBM % of Total	63.5%	65.5%	67.5%	62.0%	61.0%	60.5%
EDP: Pre-Tax Income						
Non-IBM (net)	(88)	12	123	168	34	73
IBM	627	843	1343	1389	1412	1403
TOTAL	539	855	1466	1557	1446	1476
IBM % of Total	116%	99%	92%	89%	98%	95%

It is clear from the table that in only one year out of the last five did IBM generate less than 90% of the total mainframe profits, and during that year -- 1969 -- it was just a fraction less. For the six years shown, in fact, IBM generated 96% of the pre-tax income of the ten mainframe companies studied. If losses were excluded and only positive income considered, the non-IBM manufactur-

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ers would have accounted for somewhat more -- 10% to 13% during most of the years, and a high of 17% in 1970. But losses have to count. Here's a brief look at what was happening among the non-IBM manufacturers:

- 1966 -- GE was still in business then, and lost over $100 million. Many other manufacturers had nominal losses, since Univac, Digital Equipment, and what is now XDS were the only companies operating in the black.

- 1967 -- GE cut its losses to only $60 million as Burroughs spent its last year in the red and Honeywell nosed into the black. CDC, Univac, DEC, and XDS were significant moneymakers, but RCA and NCR went further into the red as shipments increased.

- 1968 -- Things were looking up, and only moderate losses were being felt by GE, RCA, and NCR.

- 1969 -- A very good year. The only losses were felt by RCA and NCR, and they were still moderate, since really large shipment levels had not been reached. Positive income exceeded the $200 million mark.

- 1970 -- Crash! GE exits from the industry after creeping close to a black ink situation but still facing extensive investments to be able to continue in the business. CDC chalked up about $61 million in losses as Government spending was cut. And between them, RCA and NCR lost about $70 million. The other companies, however, did fairly well, and positive income was about $175 million.

- 1971 -- RCA abandoned the industry in time to at least halve its losses to the $35 million implied in its statement. NCR continued to run at a loss level of $20 million to $30 million. But some of the other companies ended the year on a healthy note. Univac alone had considerably more income than the total for non-IBM manufacturers, but must give RCA its $70 million check next week. HIS was in control and planning to announce a new series of computers in mid-January. CDC was about even.

Thus, the year 1971 ends on a mixed note. IBM's revenue from EDP activity has continued to be about two-thirds its total during the last five years. CDC's percent dropped to about 50% when it purchased Commercial Credit. Honeywell, Univac, and Burroughs have built their percentages up to about the 50% level. DEC, of course, is in the 85% to 90% range.

Only two major companies now have low percentages of EDP revenue to total. Xerox, on a pro forma basis, has seen this percentage slide from the 8% level to less than 4% in 1971. NCR has slowly been raising its percentage, but currently only 20% or so of its revenue comes from the computer area. Whether or not this low corporate involvement proves important remains to be seen. It certainly was to RCA -- in the 6% to 7% range -- and to GE -- which never brought its EDP revenues to over 5% of its corporate total.

On the profit front, not too much can be proved from the figures shown above. There is a slight trend for the percentage of profits to move away from IBM, only to return when the going gets rough. And for the next few years, the going doesn't look so rough as it has been (page 1). The industry is more mature, so perhaps this time around a more definite trend will be established.

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A DIFFERENT COMPUTER LINE-UP FOR THE U.S. GOVERNMENT

Every year the U.S. Government publishes a detailed list, or Inventory, of the computers it owns or leases plus those it pays for through contractors. All figures are based on number of computers, and the list includes general-purpose computers, dedicated application computers -- as defined by EDP/IR -- and special-purpose or military computers that we don't keep tabs on. There's nothing highly unusual in the figures for fiscal year ended June 30, 1971:

- The total number of computers used by the Federal Government is 5,961, up 13% over the year before. This falls right into the 10% to 15% annual rate of increase that has been true since 1967.

- The percentage of computers owned is now 72.1%, up from 63.9% last year and exactly 50% in 1965.

- The vast majority of the computers added during the last year are in what the Government calls its "Special management classification" -- laboratory instrumentation, communications, control, process control, and minicomputers in lieu of analog computers. Some of these are "classified" or "mobile."

To provide readers with a better basis for comparison, EDP/IR dug into the Government figures and "translated" them into the breakdowns we normally use. The table below shows the distribution -- by number and dollar -- of the general-purpose (Group A) and dedicated application (Group B) computers used by the Government. The total number reads only 5446 because we eliminated the special-purpose computers from our analysis. Their distribution by manufacturer is very similar to that shown under the numbers heading.

COMPUTERS USED BY U.S. GOVERNMENT -- JUNE 30, 1971

	Number of Computers					Value -- $ Million	
	No. Gp A	% Share	No. Gp B	No. Gp A&B	% Share	Gp A&B $M	% Share
IBM	1366	40.0	45	1411	26.0	768	40.3
CDC	180	5.3	279	459	8.4	341	17.9
Univac	845	24.8		845	15.6	224	11.8
HIS	268	7.8	197	465	8.5	141	7.4
RCA	171	5.0		171	3.1	133	7.0
Burroughs	204	6.0		204	3.7	104	5.4
XDS	58	1.7	225	283	5.2	77	4.0
NCR	298	8.7		298	5.5	43	2.3
DEC	23	0.7	687	710	13.0	30	1.6
SEL			91	91	1.7	8	0.4
HP			81	81	1.5	3	0.2
Varian			88	88	1.6	2	0.1
Others			340	340	6.2	31	1.6
TOTALS	3413	100.0%	2033	5446	100.0%	$1905	100.0

The difference between numbers and dollar value of computers is clearly illustrated above, and should be questioned when share of market is mentioned.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

AUTOMATIC DATA PROCESSING	Automatic Data Processing, Inc., 405 Route 3, Clifton, N. J. 07015, a major supplier of computer data processing services, filed on December 2, 1971 registration for 12,944 for public sale by the holder.
CALIFORNIA COMPUTER PRODUCTS INC.	California Computer Products, Inc., 2411 W. La Palma Ave., Anaheim, Calif. 92801, producer of compatible tape and disk drives and plotters, has changed its previous registration of 500,000 shares of common stock to an offering of $10,000,000 in 20 year convertible subordinated debentures. For debt repayment working capital and other corporate purposes. Underwriters are A. G. Becker & Co., and Mitchum, Jones & Templeton.
COGAR CORP.	Cogar Corp., Crosby Manor Rd., Schuyler, N. Y., producer of memory equipment and components, filed November 10, 1971 for an issue of 600,000 shares of common stock (maximum $20 per share) with the proceeds for working capital and debt repayment. Underwriter is First Albany Corp., Albany, N.Y.
COMPUMATRICS INTERNATIONAL MANAGEMENT CORP.	Compumatrics International Management Corp., 220 Park Ave., South, N.Y., a consulting firm supplying management information systems, filed on November 4, 1971 for 160,000 shares of common stock at $5 per share. Underwriters are Lehman, Bartel & Co., Inc., and A.C. Kluger & Co., N.Y., N.Y.
DATAMAC INC.	Datamac, Inc., 121 West Campbell Ave., Roanoke, Va., a management consulting, data processing and direct mail services firm, filed on November 29, 1971 for 125,000 shares of common stock at $4.50 per share. The underwriter is DeRand Investment Corp. of America, Washington, D.C.
MEASUREX CORP.	Measurex Corp., Santa Clara, Calif., a manufacturer of digital process control systems for the paper industry, filed for 6,000,000 common shares on December 21, 1971, for debt repayment and working capital. Underwriter is Eastman Dillon, Union Securities & Co., Inc., N.Y., N.Y.
PENRIL DATA COMMUNICATIONS INC.	Penril Data Communications, Inc., 5520 Randolph Rd., Rockville, Md., a builder of data communications modems, filed December 7, 1971 for 364,668 shares of common stock at a maximum of $7 per share. Proceeds will be used for general corporate use. Underwriter is Eastman Dillon, Union Securities & Co., Inc., N.Y., N.Y.
TEKTRONIX	Tektronix, Inc., 14150 S.W. Karl Braun Dr., Beaverton, Ore., producers of CRT terminals and oscilloscopes, filed on December 8, 1971 for 133,755 shares of outstanding common to be offered from time to time by an underwriter yet to be named.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" JANUARY 17,1972 • VOL.7,No.6 P.J.McGOVERN,EDITOR

Toward distributed computing

TERMINALS OUTFLANKING KEY-ENTRY STATIONS AS GROWTH CONTINUES
IBM SURPASSES EVEN TELETYPE AND 'WELL-KNOWN' CRT SUPPLIERS

By the end of this year, the number of terminals used with computers will be larger than all the keypunches, key-to-tape units, and key-to-disk stations put together.

When discussing computer industry economics, most people are quick to point out IBM's installed base of about 200,000 keypunches . . . a legal money machine, as it were. Not many, however, notice that IBM alone has about 100,000 installed terminals of all sorts, and that most of these are bringing in more rental than a keypunch. Nor have many remarked that Teletype Corp., an AT&T subsidiary, provides the computer industry with the modern equivalent of the keypunch . . . the 50,000 so ugly, noisy, protean Teletypewriters talking to computers.

The number of terminals installed with computers grew right through the recession at a 30% clip, and this rate will continue for the next several years in the continuing trend toward distributed processing. Reasons for this growth:

- Terminals take advantage of the speed of electronic data processing as keypunches never could. An airline clerk, for example, can query a data base while a customer is waiting: "Got a coach seat on the 4 p.m. for Newark?" "Then reserve that seat for . . ."

- Users are finding fewer errors if a person familiar with the meaning of data -- rather than a keypunch operator, functioning mechanically -- enters information into the computer. As a result, more and more terminals are being used for source data capture, since the cost for finding input errors grows as the number of steps taken increases.

- Conversational timesharing requires terminals that give rapid access to computer power, and use of this access method is growing.

- Most important of all, terminals -- and the processing power needed to run them -- are constantly becoming less expensive.

EDP/IR projects that the installed base of terminals will quadruple between 1970 and 1975, making terminals one of the most dynamic sectors of the computer industry. Most of these will be interactive keyboard devices or CRTs; a growing

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number, however, will be intelligent terminals (EDP/IR June 30,1971) or small computers. This issue takes a look at the terminal marketplace today . . . and considers where it may be in the mid-1970s.

Two quiet giants amid lots of chatter

Much of today's terminal business is captured by two major suppliers -- IBM and Teletype Corp. Both these organizations tend to be quiet about their success. But many other suppliers see the market potential and are excited about possibilities, so few days go by without press announcements of one sort or the other. During the past few weeks, for example, several companies have been proud enough of their success to publicize where they stand.

- Singer revealed that it had 3,000 point-of-sale terminals and supporting systems at work in 200 retail stores, and orders for its MDTS system, it says, total over $100 million.

- TRW disclosed it has 20,000 credit verification terminals in use, putting this private system into the same installed-base class as Bunker-Ramo's 20,000 terminal system for the financial community.

- And RCA Service Company, which started third-party leasing Teletypes during 1970, said that it had 1,800 lease customers and service contracts on some 20,000 of these TTYs.

Booming along as it is, however, the terminal market is certainly not a wide open field. Many have tried and failed, though most not so dramatically as the well-publicized venture described below.

Corning at Waterloo

In April, 1970, Corning Glass Works' newly formed Data Systems Department went all out in announcing its first product, the 904 interactive display terminal. The 904 used a photochromic glass display that allowed the presentation of alphanumeric data and curves, had a minicomputer that could plot a function or create a polynomial to fit given data, made hard copies electrostatically, let users display slides on the screen, and communicated to computers at 300 characters per second.

Effectively, the 904 gave users a Teletype, CRT, minicomputer, page copier, and slide show all wrapped up in one $19,650 package. It sounded like exactly what everyone said he wanted. It flopped.

In May, 1971, Corning announced that it was withdrawing the 904 from the market because it couldn't find any buyers. In a year of marketing the Data Systems Department had peddled just about a dozen of its 904s, and is no longer around.

Why did such a flexible, powerful, and reasonably inexpensive piece of equipment strike out? There seem to be two reasons: The 904 wasn't powerful enough, and it was too glamorous. On the one hand, Corning found a market for really fancy graphics terminals . . . those capable of 3-D presentation and image rotation, and selling for $100,000 or so. But the 904 wasn't that fancy. On the other hand, the company found that the terminal market was largely composed of users who simply wouldn't pay $20,000 for a terminal if their lives depended on it. And they stayed away from the 904 in droves.

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ESTIMATED AND PROJECTED BASE OF KEYSTATIONS AND TERMINALS

Year	Number of Keystations*	Number of Terminals+	Total
1970	281,000	200,000	481,000
1971	312,000	262,000	574,000
1972	333,000	354,000	687,000
1973	345,000	469,000	814,000
1974	341,000	615,000	956,000
1975	319,000	774,000	1,093,000

* Including keypunches, key-to-tape, key-to-cassette, and key-to-disk, but not including verifiers.

+ All terminals except large private systems, such as Bunker-Ramo's Telequote or TRW's credit authorization system.

What the user wants

At yearend 1970, estimates by the International Data Corporation, publisher of EDP Industry Report, show that some 200,000 terminals were installed in the U.S. (table, above). This excludes special-purpose terminals such as those for Bunker-Ramo's Telequote service and TRW's credit-authorization system, but includes remote-batch terminals and factory data collection devices. Of the 200,000, about 126,000 were keyboard terminals, primarily from Teletype and IBM (see page 5).

Indeed, Model 28, 33, and 35 TTYs alone accounted for 25% of all terminals installed. And IBM's 1052, 2740/2741, and special-purpose typewriter terminals numbered over 56,000, or 28% of installed terminals.

TTYs and 2741s are not powerful, flexible, glamorous devices; they are dull, reliable machines that get the work done cheaply and reliably. This is what customers want -- no fuss, no frills. For a majority of users, a terminal is something to forget about . . . as available and unobtrusive as a light switch.

This seems to be why IBM and Teletype have the keyboard terminal market sewed up for all but specialized applications. Both companies provide unrivalled service, keeping mean-time-to-repair low. In addition, the Teletype terminals are cheap -- less costly than a CRT and much less dear than any other printing terminal. IBM printers have a little more flexibility and the advantage of being manufactured and sold by IBM.

Alternate technologies are available, however, and many companies are trying to find a niche in the marketplace. Among them:

- Faster impact printers. TTYs print at 10 or 15 characters a second, and 2741s are limited to the Selectric's speed of 14.8 cps. But terminals that can print faster save the user time and line charges, so a number of companies have offered TTY or 2741 replacements that print at 30, 60, or even 120 cps -- companies such as GE, Univac, Memorex. They claim that the savings in operating costs make up for the higher expense of the terminal. Their success, though, has been limited;

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they usually have the problem of convincing a Teletype user that he should switch to a terminal that costs three or four times what he currently pays for a Model 33.

- Non-impact printers. These devices use an entirely different way of printing -- specially treated paper and print heads that heat up is a common technique -- to get rid of the clatter-bang of impact printers and improve reliability by reducing the number of moving parts. They can't, however, make copies, and the special paper is more expensive by far than untreated paper. Non-impact printers haven't made significant inroads in the installed terminal base.

A survey of Teletype users conducted last year by IDC revealed that the most important factor to users choosing a terminal is cost, and the second most important is reliability. Both factors favor IBM and Teletype. Batch users also want intermediate storage. For this, Teletype sells a $2,400 tape cartridge and has paper tape; IBM has announced that its Magnetic Card/Selectric Typewriter can be used in communications, but it is expensive. Timesharing users are most concerned with transmission speed, notably to reduce CPU and line charges.

A phosphorescent gleam

The second largest part of the terminal market belongs to CRTs. CRTs of all types currently account for 19% of the terminals in use, but this should rise to 26% by 1975, giving CRTs a growth factor of 5.7 -- greater than any except small batch terminals (page 5).

The lion's share of the CRT base consists of what EDP/IR calls "enhanced editing" terminals -- those with sufficient memory and power to enable the operator to delete and insert with a simple command a line, word, or character from a file displayed on the screen. This is something that can't be done with a TTY or the TTY-replacement CRTs.

One reason for the popularity of enhanced editing terminals is simple -- it doesn't cost much to add a little flexibility to the device once the tube, memory, and control electronics are in place. Another reason is equally simple -- this is the category IBM's 2260 fits into, and IDC estimates that the 26,000 of these devices installed constitute 68% of all the CRT terminals under discussion.

Most of the recent innovations in CRT hardware have come from the independent manufacturers. IBM's 2260, by comparison to available independent terminals, is antiquated, inflexible, and expensive. (The independents compete with each other on a price basis.) This competition in the marketplace, however, may have been a factor in IBM's decision to announce its new general-purpose CRT, the 3270. On a price/performance basis it is far superior to the 2260. So, despite the hardware and software incompatibility between the two, many 2260 users will doubtless make the switch to the 3270.

The implications of the 3270 (EDP/IR Oct.19,1971) cannot be over emphasized. To a degree, the announcement of this system shows that IBM can be forced by the marketplace to attack its own installed base. Also, it leads EDP/IR to believe that the industry Giant is leading customers directly from the keypunch to direct data entry . . . skipping the key-to-tape and key-to-disk input technique in any major way. It would not be surprising, then, to see IBM turn to its vast typewriter base for future input methods . . . directly or through optical reading.

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BREAKDOWN OF TERMINALS IN USE IN 1970 AND 1975

	In Use, 1970	In Use, 1975	Growth Factor
Interactive Keyboard			
IBM (1050, 2741, and other)	56,150	195,000	3.5
Teletype Corp. (Model 33, 35, and others)	49,605	122,550	2.5
Others	20,475	124,000	6.0
Total	126,230	441,550	3.5
Alphanumeric CRT			
IBM (2260 and others)	25,300	125,840	5.0
Others	9,200	64,410	7.0
Total	34,500	190,250	5.7
Graphic CRT			
Total	3,500	26,000	7.5
Small/Medium Batch			
Total	2,900	45,000	15.5
Large Remote-Batch			
Total	5,250	23,400	4.5
Data Collection			
Total	27,905	95,800	3.4
Grand Total (All Terminals)	200,285	822,000	4.1

The case for curves

Interactive graphics CRTs are designed to display and manipulate curves, unlike the more popular alphanumeric units, which can only make very rough approximations of a curve with long, fixed-length, right-angle line segments. Graphics terminals allow an engineer, for example, to design a part with the aid of a computer. With simple commands he can alter a line or dimension, rotate the image of the part to obtain a new perspective, or magnify a section of the image. Once he is finished, the computer can redraw the image on a plotter for blueprinting, or print out the image's specifications. All this saves the designer the time, bother, and expense of drawing repeated changes by hand.

The terminals, though, are quite expensive, in the $50,000 to $100,000 range. They also consume great amounts of computer memory and processing time. As a result, the number of applications where their use is cost-effective has been lim-

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ited, and they have yet to be important, by numbers, to the installed base of computer terminals in this country.

Some long overdue developments considerably brighten the prospects for graphic terminals. First, the price has come down. Several terminals are available in the $10,000-to-$20,000 range, and Tektronix sells a model for $4,000. Second, a few suppliers are beginning to remove the large computational ability that has been necessary in these terminals. Conographic Corp., for example, has incorporated into its $10,000-to-$15,000 unit a curve generator that reduces from thousands to a half-dozen the number of bytes necessary to describe a curve. It simply uses polar rather than rectangular coordinates.

EDP/IR estimates that only some 3,500 graphic CRTs were in use in 1970. Developments lowering the cost of purchase and use of the machines should be a big boost to this market, and some 26,000 units are expected to be operating by the end of 1975. Growth of this sort will not be easy, however, since marketing is a challenge. Graphic CRTs are sophisticated devices, and require extensive user education and hand-holding. Competition will continue from low-cost plotters.

Prognosis

The trend in the computer industry is toward more communications . . . away from batch processing and toward on-line systems. So terminals -- for source data entry, inquiry/response systems, alphanumeric and graphic timesharing -- will become increasingly more important to the computer user.

EDP/IR estimates that the number of general-purpose computers with terminals will grow from about 32% at yearend 1971 to over 45% by the end of 1975, with the average CPU in that 45% driving 15-to-20 terminals. And this projection excludes very small computers -- those renting for less than $2,500 per month. A large number of these will have a few terminals or actually be used as terminals themselves. Mainframers -- including IBM -- are quietly pushing in this direction . . . toward distributed data processing. As this happens, the computer will change from a glorified accounting machine to a tool for many people to feed and use.

\+ + +

IBM REALIGNS U.S. COMPUTER OPERATIONS, SPLITS DATA PROCESSING GROUP

Shortly before IBM announced its record sales and earnings last week, it put the finishing touches on management changes and the organizational structure that will pace the company into the mid-1970s. T. Vincent Learson, announcing the first organizational "realignment" since he was elected board chairman and chief executive officer of IBM last summer, said the move would beef up management in important areas. Observers are saying that it is an indication that Learson intends to have more direct control.

- IBM's giant Data Processing Group was split into two operating groups -- one for marketing and services, the other for development and manufacturing. This brings to four the number of entities reporting to the company's Corporate Office composed of Learson, President Frank T. Cary, and Thomas J. Watson, Jr., now in semi-retirement but still chairman of the executive committee.

- The company's management committee -- created four years ago as an input buffer for corporate management (EDP/IR Oct.19,1967) -- seems to

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have been relegated to the sidelines as Learson tapped its top talent for line management of IBM's data processing operations.

- Individual futures among high-level IBM executives have been better spelled out. Overly simplified, it looks as if George B. Beitzel, a "Watson man," has been sidegraded to IBM's "other group" -- making room at the top for the two men now heading Learson's DP team, Dean R. McKay and John R. Opel.

In discussing the announcement, IBM spokesmen emphasized the company's desire to help the user become more productive, a trend that is beginning to underlie many announcements coming out of the mainframe manufacturers. Learson commented on this in describing the split in the company's U.S. data processing organization:

> With the marketing group, we shall step up the effort in customer applications development to take advantage of new and developing opportunities for the wider use of advanced computer products. Establishment of the development and manufacturing group takes into account the increasing importance of semiconductor technology and its integration in the design and manufacture of systems. Together, these moves will help us to do a better job in exploiting the potential of this rapidly advancing technology and speed improvements to the marketplace.

IBM's new shape at the top

Prior to last week's announcement, IBM had three primary subdivisions of its 12 divisions and three wholly owned subsidiaries:

+ Data Processing Group (headed by Beitzel) composed of six divisions: Data Processing (marketing), Field Engineering, General Systems (System/3, System/7, 1130, 1800 manufacturing), Systems Development, and Systems Manufacturing (360/370).

+ World Trade Corp., which conducts IBM's business outside the United States directly or through subsidiaries.

+ The "other" group consisting of the Office Products Div., Federal Systems Div. (for advanced and airborne needs of the U.S. Government, not standard products), Information Records Div. (supplies), Service Bureau Corp., and Science Research Associates, Inc.

In addition, IBM has a Research Div., a Real Estate and Construction Div. and the Advanced Systems Development Div. This latter group now moves over into the data processing group that deals directly with customers.

The Data Processing Group was established during 1966; it formed a layer of management considered necessary as System/360 deliveries started and vast new problems began for IBM. It now has been split, as follows:

Marketing + Services (McKay)	Manufacturing + Development (Opel)
Data Processing	Components
Field Engineering	General Systems
Advanced Systems Development	Systems Development
	Systems Manufacturing

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The move of ASDD into McKay's group brings software responsibility directly under marketing control. A company spokesman says this will "bring leading edge application assistance that may involve new technology." New products, however, will still remain the responsibility of the group headed by Opel.

NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

AUTREX INC.	Autrex, Inc., 55 William St., Wellesley, Mass. 02181, the operator of a block trading system for a securities industry, has filed a registration covering 269,234 shares of common stock. They will be offered by company and a underwriting group headed by F.S. Smithers & Co., Inc., 45 Wall St., New York, N. Y. 10005
COMMERCIAL CREDIT COMPANY	Commercial Credit Company, Baltimore, Md., has filed $100,000,000 in the senior notes to 1979 and 1992 proceeds for debt repayment and working capital. Commercial Credit is a subsidiary of Control Data Corp. Underwriters are Kidder, Peabody & Co., Inc., and White, Weld & Co., New York, N. Y.
COMTEN INC.	Comten, Inc., 1950 West County Road, St Paul, Minn. 55113, is offering 480,432 shares of common stock to stockholders under a rights plan whereby owners may purchase one new share of stock for each 5 shares held on January 11, 1972. Prospectus may be obtained from the company.
DATA GENERAL CORP.	Data General Corp., Route 9, Southboro, Mass, has filed for 60,000 common shares to be offered by selling stockholders through an underwriter yet to be named.
DIGI-LOG SYSTEMS INC.	Digi-Log Systems, Inc., 666 Davisville Road, Willow Grove, Pa., plans to offer 200,000 common shares having maximum of $6 per share for working capital in the design and production of a device which converts T.V. sets into computer terminals. Underwriter is J.S. Logan & Co., Inc., New York, N. Y.
NATIONAL TELEPHONE CO.	National Telephone Co., 100 Trustees Park Road, E. Hartford, Conn., filed registration for 125,000 common shares at $4 each for working capital related to telephone and interconnection equipment leasing. Charles Beck & Co., Inc., New York, N. Y. is the underwriter.
PROGRESSIVE TELE-COMMUNICATIONS INC.	Progressive Telecommunications, Inc., 180 Lauman, Hicksville, N.Y., an office communications equipment company filed 105,000 common shares and options at a price of $6 per unit. Underwriter is Options on Shares, Inc., New York, N. Y.
TECH TRAND INDUSTRIES	Tech Trand Industries, 580 Jefferson Road, Rochester, N. Y., builder of computer input and output terminals, filed 150,000 common shares at $4 each, for debt repayment and expansion purposes. Underwriters are Herbert Young & Co., New York, N. Y.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" FEBRUARY 8,1972 • VOL.7,NO.7 P.J.McGOVERN,EDITOR

Honeywell announces Series 2000 -- Page 6

CONTROL DATA AND NCR FORM JOINTLY OWNED PERIPHERALS COMPANY; OTHER AGREEMENTS IN PRINCIPLE COULD LEAD TO UNIFIED PRODUCT LINE

The program announced here today will certainly be more difficult to implement than an outright merger between the companies.

-- William C. Norris
President & Chmn.
Control Data Corp.

To a meaningful degree the cooperative program, both in mainframes and in peripherals, will result in a much more effective utilization of R&D investment both in hardware and software development.

-- R. Stanley Laing
President, NCR

Just weeks after Univac picked up the RCA pieces, and shortly after Honeywell announced that it had made the GE merger work (story, page 6) CDC and NCR wheeled out their top brass to announce "agreement in principle on a broad cooperative program designed to expand each company's future role in the general-purpose computer industry."

This is certainly not a merger, and might lead to jurisdictional problems. It is the start of a program that could produce inseparable product lines -- and the basis for more and more cooperation -- a few years hence. Here's a brief rundown on what the two companies announced:

- Establishment of a jointly owned (50-50) company that will engineer and manufacture punched-card equipment, magnetic tape equipment, and high-speed printers. The new company, yet to be named, will be given assets of $50 million, and will sell only to the two parent companies. It will therefore have no marketing staff.

- An agreement under which the "mainframe development programs of Control Data and NCR will achieve a high degree of compatibility through the use of similar architectural concepts and related software." As part of this activity, NCR will develop a "swing" computer that will bridge the two computer lines now under development. The swing com-

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puter will operate in three modes, through a microprocessor, as the largest NCR computer, as the smallest CDC computer, or as another manufacturer's system.

In addition:

- CDC will supply disk memory products to both companies. To beef up its capability at the low performance end -- and perhaps to provide better manufacturing control -- CDC will purchase NCR's disk product line and disk file engineering and manufacturing facility located in Hawthorne, Calif.

- NCR will supply Control Data's needs for special-purpose serial printers for low-speed or terminal applications.

Under the agreement -- approved by the boards of directors of both the companies -- each of the mainframers will retain its separate corporate identity and full independence in the marketplace, "continuing to serve their chosen markets and pursuing their own individual business strategies." Each company will be able to continue its outside OEM peripheral business as before, selling its own products or those manufactured by the joint venture.

Old dogs . . . new tricks

The joint peripherals venture looks more like a restatement of current OEM practices than anything else . . . unless it is a prelude to merger (see page 5). The real impact of this cooperative program -- if there is any -- is a few years out. It will come from the unified product line the two companies hope to develop. And that, to a great degree, hinges on the swing processor.

Key to the swing processor will be a microprogramming technique much like that used by IBM in the 370/135 and 370/145. It depends on microcode -- computer language that has a one-to-one relationship to actual hardware. This technique popped up in a few computers developed during the 1950s, and has been used more recently by minicomputer manufacturers in adapting computers to dedicated applications. But it really never made much headway in the general-purpose field until IBM adopted it.

Since that happened, everyone seems to be thinking microcode. One reason for the renewed interest in microprogramming is cost. Previously, microcode was implemented in logic, then in read-only memory (ROM). But these techniques were expensive, and too inflexible for general-purpose use. Now, fast changeable ROM can be implemented with semiconductors at competitive costs, and microprogramming is back in vogue. Almost every technical journal in the computer field currently has at least one article per issue about this subject.

To the user, microprogramming means greater compatibility between different computers. IBM has provided this for certain 7000 and 1400 series users in the 370, and now CDC and NCR propose to do it for their "swinger." Manufacturers will be quite reluctant to give users true access to the microcoded control storage, for with this the user could change the very nature of his computers. But it looks as if at least one other force will be offering the advantages of microcode.

Engineers are accustomed to using microcode for laboratory and developmental computers, so the effort involved, though possibly substantial, is not pushing the

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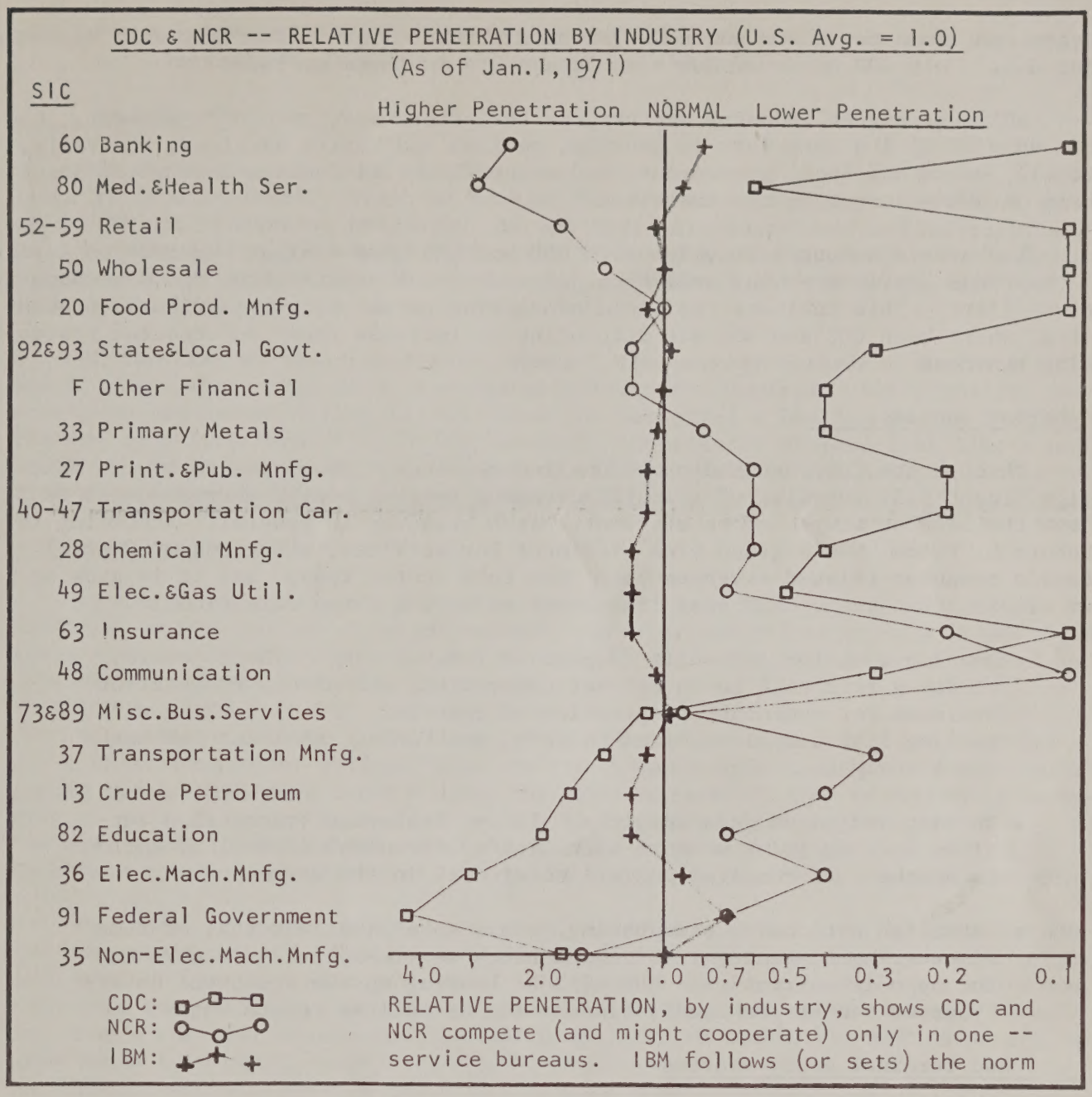

state-of-the-art. In fact, the CDC/NCR swing processor may be only one of several that will show up in the marketplace during the next few years. Univac will probably have to chose this course to provide an avenue of growth for its base of RCA users, and Honeywell (see page 6) will almost certainly use this technology in the new product line that finally integrates the GE and Honeywell components currently being upgraded within the HIS product array.

Non-competitive penetration

As the above chart shows, both CDC and NCR have above normal penetration in the non-electrical machinery manufacturing sector. This reflects, to some extent, each company's own use of computers. CDC's three strongest industry sectors -- Federal Government, electrical machinery manufacturing, and education -- account for over half its computers installed in the U.S. These industries -- plus aero-

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space and crude petroleum where CDC also is strong -- are relatively weak segments for NCR. Only 10% or so of NCR's computers are in these sectors.

NCR's strongest industry sectors, on the other hand, are CDC's weakest. CDC has only 5% of its computers in banking, medical and health services, wholesale, retail, state and local government, and other financial institutions where about half of NCR's computers are installed.

The single industry in which both CDC and NCR have similar penetration levels -- business services -- may well be a point of great benefit from the new cooperative effort. This includes the field of on-line services, or distributed processing, where both CDC and NCR are attempting to increase their information processing business.

Cybernet centers. . .

Through its Cybernet and other on-line services, CDC claims to be the most significant U.S. supplier of scientific remote batch computer services, and to have the largest single share of remote batch business in general. According to Robert M. Price, CDC's group vice president for services, about 25% of Control Data's computer-related revenues come from this sector today, and it is growing at almost 20% a year. CDC sees its thrust as having three directions:

- Develop uses for off-shift (7 p.m. -- 7 a.m.) time. The major way of doing this will be to attract commercial, end-of-day transaction business for overnight preparation of reports. CDC is working with mailing list compilers, fund raisers, and banks. At least one bank has already been signed up.

- Develop dedicated data services. Today, Brokerage Transaction Services Inc. (a joint venture with GT&E's Ultronics) is one, Ticketron is another. A hospital-medical service is in the works.

- Establish nationwide timesharing. This move parallels that of some timesharing companies into remote batch services, but is a move in the opposite direction. CDC will be beefing up the equipment in its Cybernet centers to handle timesharing as well as remote batch.

. . . and terminal entry systems

NCR, on the other hand, has been quietly moving into the on-line processing area. Its efforts began with savings banks back in the mid-1960s, and has been progressing well in this area. During 1971, EDP/IR estimates that NCR had revenues of about $10 million from this area.

NCR offers specialized services that can take advantage of its ten service centers around the country. One of its techniques for providing reliable business is to sell a larger bank on an in-house system at the same time it offers equivalent services for smaller banks in the same area. Thus, the two operations -- often physically located in the same building or quite close geographically -- can provide backup for each other and hold costs down.

With its new line of terminals -- the 270 and 280 -- NCR is going after more retail and financial business. This, it thinks, is another way of providing the entry-level computer requirements needed by the 100,000 businesses and other or-

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ganizations that currently use NCR accounting machines. Also, it is a way of tapping the relatively "uncomputerized" retail and wholesale markets.

. . . lead to cooperation

NCR doesn't manufacture the large central processors that are needed in any large terminal network. This, of course, is one reason for its cooperative venture with CDC. Already, overseas, the two companies have been working together in supplying systems. A large Swiss bank recently announced that it has ordered a CDC mainframe to be connected on-line to hundreds of NCR terminals, and more such projects are thought to be in the works.

At the time of the recent announcement, the company spokesmen for both CDC and NCR emphasized that there were no marketing implications. Specifically, they said that, at present, they had no plans for marketing a banking system similar to the one in Switzerland. To EDP/IR, however, these large systems look like a natural. It would seem that joint marketing efforts would be primarily a matter of time if the deal is to pay proper dividends.

A hint of merger?

At the press conference called to announce the agreement, Laing said the discussions, which started about mid-summer, were the natural outgrowth of OEM agreements already in effect between the two companies. "Merger was never part of our objective." Norris nodded in agreement.

Some observers were quick to say "the two companies couldn't get together . . . their management philosophies are too different . . . it's the best possible result two losers could expect under the circumstances." CDC is currently operating at just about the breakeven level with its computer operations and NCR -- after many years of direct loss from computers -- may finally get into the black this year as the base of installed Century computers starts to prove its worth.

On paper, at least, a CDC/NCR merger is the most likely one around, and the one that would cause fewest waves. The two mainframers complement each other in both product line and customer base. NCR doesn't make a computer that rents for much more than $20,000 a month; CDC doesn't make one that rents for much less. And from a customer standpoint, by and large, CDC is weak where NCR is strong, and vice versa (see chart, page 3).

So despite all the official denials, this could be a stepping stone to merger. NCR's legal counsel, responding to a question at the press conference, admits for both parties that "we have discussed our plans with the Justice Department in detail, but we have neither sought nor received formal clearance. Under antitrust law, the creation of a joint venture is tested in the same manner as a merger."

Hypothetically, then, the legal hassles can take place before too many organizational changes occur. Finally, if everything is clear and the two companies decide to proceed with merger discussions, there would be no roadblocks.

But for the short term, the situation may be business as usual to the outside world while legal and other details are decided. Even if Justice decides it has no objections to the joint venture, IBM could muddy the water. As Norris says: "We feel the arrangement is a perfectly legitimate method of solving our mutual problems [but] a counterclaim by IBM would not surprise me. It has happened be-

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fore." He is referring to the charge by IBM that Multinational Data Ltd. -- the joint research company set up by ICL, Control Data, and CII (of France) and termed "The Club" by IBM -- is in violation of antitrust regulations. This was spelled out in a counterclaim to CDC's original antitrust suit against IBM.

What does this mean?

To the computer user, the CDC/NCR announcement comes as a pleasant surprise. Many non-IBM users in general were upset when RCA crashed its way out of the computer industry, so a quiet and reassuring move -- presented in a positive fashion as this was -- helps to restore a certain amount of confidence to the prevailing mood. Some NCR customers, in particular, had wondered what sort of upgrade path they could look forward to. Now, at least, they know it will be compatible . . . and will lead as far upward as they care to move.

Industry participants don't seem to care . . . one way or the other. The two companies didn't compete, and won't. Furthermore, each competes primarily with IBM, so any strength they bring in this department can only be helpful to the other mainframers as they chip away at Fortress IBM.

There are certainly international overtones to the CDC/NCR announcement. CDC has participated in the cooperative research program mentioned above and not too long ago announced a development plan in connection with CII. Norris, at the press conference, implied that the joint development effort with NCR could well be tied in -- eventually -- with "other international agreements."

In Europe, the move toward consolidation -- at least through standards -- continues. In the wake of the RCA demise, Siemens, its European licensee, has entered into a cooperative agreement with CII and Philips of the Netherlands. ICL might be included in such an arrangement, especially as Britain merges into the Common Market. Thus, in one way or another, all the major European computer manufacturers are moving toward ties of some sort.

All of this might lead to the creation of a "second force," as ICL's chairman describes what is needed in the computer industry (EDP/IR Dec.17,1971). In the meantime, the CDC/NCR agreement will probably save money by eliminating duplicate development efforts. That, in time, will make the companies more profitable and therefore more stable and competitive for the long haul. Eventual merger would not be surprising. In the interim, it would be surprising if the computer service offerings of both companies aren't strengthened. Bringing an effective swing computer to market will be the real challenge during the next year or two.

HONEYWELL ANNOUNCES SERIES 2000 AS UPGRADE FOR MEDIUM-SCALE SERIES 200 USERS; COMMUNICATIONS PROCESSOR AND VISUAL CONSOLE SPICE UP EVOLUTIONARY OFFERING

> *We made the merger work. We reorganized to eliminate redundant staff functions, gave maximum operating flexibility to each operation, and molded the merged companies into one lean, trim, cohesive organization.*

That's the way Edward C. Lund, vice president and general manager of North American Operations for HIS, summed up the year or so since GE and Honeywell merged their computer operations. The occasion was a January press conference called "for a special report on [Honeywell's] computer business and to announce a major new series of information systems."

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Consolidation pays off

The economics of merger may have never been in doubt. But just to dispel any questions that remained, Lund pointed out that the computer work force had been reduced from 49,000 to 46,000 and that computer system responsibilities now were split among four worldwide centers:

Small computers -- Italy
Small/medium systems -- France
Medium-scale systems -- Boston
Large computer systems -- Phoenix

To offer more concrete proof, Honeywell Inc. issued its financial statement this week, pointing out that earnings increased considerably in the fourth quarter of 1971, largely because of its computer business. Worldwide computer sales and rental revenue reached $950 million, up 11%, and accounted for almost half the company's total. James H. Binger, Honeywell chairman, summed up by commenting that the merger with GE's computer operations had brought "benefits even beyond our expectations."

"Complex needs of experienced users"

No bones were pulled with the product announcement. The word "new" was carefully omitted from the description of the Series 2000 processors, and their availability by April and May of this year brought home this point. The line is compatible with the 200 series and provides increased price/performance. Those are the things customers want . . . those, and communications capabilities.

And the Series 2000 "family" includes a "new DATANET 2000 front-end processor and operating system [that] extend communications capability throughout the medium portion" of the line. This DN 2000 is a minicomputer-based processor that handles up to 120 communications lines and allows up to 15 independent operations to be performed simultaneously.

The largest model in the series is the 2088, a dual-processor system that will rent in the $40,000 to $45,000 range, higher than any true member of Honeywell's Series 200. (The 8200, announced somewhat after most other models in the 200 line and first delivered three years ago, is gradually replacing Honeywell's 10-year-old base of 800/1800s.) The other four fit into the medium-scale range, where some 64% of Series 200 equipment is located:

HIS -- U.S. INSTALLED BASE AT YEAREND 1971

Systems	$ Million	%	Rental ($/mo.)	Series 2000	
G-50 & 100	45	2%	$ 2- 5,000		
G-200s & 400s	390	18	13-22,000		
G-600s & 6000s	315	15	45,000+		
H-105--120	350	17%	$ 2- 5,000	H-2040	$ 9,000
H-125--2015	620	29	7-15,000	H-2050	13,000
H-2200--4200	200	10	15-30,000	H-2060	17,000
H-400,800,8200	200	9	30,000+	H-2070	24,000
Totals	$2,100	100%		H-2088	42,000+

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The figures shown are for the U.S. only, since the announcement applied only to Honeywell's North American operations. An examination of the U.S. base gives a good approximation of where Series 2000 is pointed immediately. There's no question, of course, but that it will eventually be released in Europe.

Some new peripherals

As mentioned above, the Series 2000 includes the DN 2000 data communications processor. It will function with a 200 or a 2000 computer system under control of the OS/2000 operating system, introduced with the computers. This control processor -- to be available in the third quarter and rented for about $1,000 a month -- is a nifty little computer on its own right. It can have 24K to 65K bytes of memory, 75 basic instructions, and has a 385 nsec. cycle time per byte.

And the new operator station is rather jazzy, too. Called the Visual Information Control Console, it is standard on the 2070 and 2088, optional on smaller 2000s or 200 series processors. It includes a typewriter keyboard with special program parameter keys, a separate 10-key numeric pad, and two CRT screens (one of which is optional) that display 1,920 characters, formatted in 24 lines of 80 characters each (standard punched card format). In addition to the dual display, the VICC can have a 40-character-per-second serial printer, a 23-inch remote display, and a switch that allows the operator to follow the computer's status.

Finally, Honeywell is offering its Type 275 disk pack drive subsystem. Initially, it will be based on Control Data's version of the 3330 (but not compatible with the IBM product); eventually, Honeywell plans to make the drive. The system can have from two to eight drives, with total storage capacity of 147.2 million characters. Average seek time is 57 milliseconds and deliveries start in April. Two drives and a control will rent for $1,320; additional drives can be added to the control for $440 a month additional.

The business sense of it all

In case anyone wonders why Series 2000 has been treated as a "ho-hum" announcement, the answer is simple -- it is . . . to headline-writing reporters, at any rate. The fact remains, it's what the customers want. Honeywell reported results of a user survey, and the findings are clear. Users want:

- better utilization of equipment (more performance)
- a more comprehensive operating system
- data base management capability
- more communications orientation

That's exactly what they get in Series 2000. For about the same price, users can move over and get 30% more performance. Hopefully for HIS, they'll move up a little and take 50% increases. But for those that are happy as they are, Honeywell announced an incentive "hang in there" contract offering 4%, 8%, or 13% lease reductions for users that will renew Series 200 equipment for 1, 2, or 3 years.

For the time being, then, the HIS approach is clear. It upgraded the old GE 600 line to the 6000, and orders zoomed. Now, it is doing the same for the heart of its line, and the same is expected. Eventually, of course, it will offer a microprogram transition from both the old Honeywell and the GE lines to a new product line. But for the present, at least, it looks like more business as usual . . . with the advantage going to the user and the Honeywell stockholder.

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FEB 28 1972

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" FEBRUARY 22,1972 • VOL.7,NO.8 P.J.McGOVERN,EDITOR

The letter of the law

IBM DISCONTINUES MAINTENANCE ON CPUs "SUBSTANTIALLY ALTERED" FOR EXTENDED MEMORY; COURT ORDERS STATUS QUO FOR ITEL/AMS USERS UNTIL MARCH 2 HEARING

Shortly after several independent companies began offering main memory boxes that not only were "plug compatible" with those supplied by IBM for System/360 but that were also able to expand memory size above IBM's established maximum, along came THE PRICE CUT OF 1971 (EDP/IR June 2,1971). Computer industry observers quickly began to wonder how long it would be before IBM reacted.

Apparently, IBM began a careful inspection of computers with memory supplied by others . . . especially those where the memory size was extended beyond the maximum supplied by IBM. Just before 1971 ended, it notified at least two users who had expanded their 360/30s from 32K to 128K with Data Recall units marketed exclusively by Computer Investors Group. IBM said it had conducted a "detailed engineering examination" of the computers and "concluded it is not practical for an IBM customer engineer with standard training and experience on a Model 30 to maintain your substantially altered machine."

Neither IBM nor Data Recall announced this. In fact, executives of CIG began a series of communications with IBM in an attempt to resolve the situation. But word slowly leaked out, and Itel -- which markets 360 and 370 memory boxes made by Advanced Memory Systems, Inc. -- moved to prevent the same thing from happening with its customers. Not only did Itel and AMS jointly file suit against IBM; they asked for -- and got -- a temporary restraining order that essentially keeps things the way they have been; i.e., with IBM maintaining some CPUs that have AMS memory units attached (see page 2).

The hassle over memory extension may be marketing oriented (as some casual observers claim) or technical (as IBM asserts). In any event, the legality of IBM's action is based on the 1956 Consent Decree. In it,

> IBM is hereby ordered and directed: . . . to offer to maintain and repair . . . electronic data processing machines for the owners of such machines; provided that, if any such machine shall be altered, or connected by mechanical or electrical means to another machine, in such a manner as to render its maintenance and repair impractical for IBM personnel having had the standard training and instruction provided by IBM . . . then IBM shall not be required . . . to render maintenance and repair service . . .

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TEMPORARY RESTRAINING ORDER, U.S. DISTRICT COURT, NORTHERN CALIFORNIA

1. Defendant IBM is hereby temporarily enjoined and restrained until and including March 2, 1972, from refusing to continue in the same manner as it has in the past to render maintenance service to an IBM Model 2030 [CPU] to which there is attached a memory unit manufactured by [AMS], which increases the total memory capacity of such CPU to a level in excess of [64K]; provided that a person with the right and authority to do so requests such maintenance service and provided further that when compensation to IBM for such maintenance service is customary pursuant to IBM's existing Multiple Supplier System Bulletin such person agrees to pay IBM for such service at IBM's regular time and material rates.

2. Nothing in this order shall prevent IBM from causing a memory unit manufactured by [AMS] attached to an IBM Model 2030 CPU to be removed or detached temporarily if, in IBM's judgment, such detachment or removal is necessary in order for IBM to discharge its obligations under paragraph 1 above.

3. The temporary restraining order . . . will continue in effect until and including March 2, 1972, on the condition that plaintiffs refrain from installing any additional memory units manufactured by AMS as an attachment to an IBM Model 2030 CPU, which will increase the total memory capacity of such CPU to a level in excess of 64K or, in the alternative, that plaintiffs advise the customers receiving such attachment in writing that IBM claims that it may be "impractical" for IBM to perform maintenance service on such a CPU; and on the further condition that on or before February 15, 1972, an undertaking in the sum of $5,000 be filed to secure costs and damages which may be incurred or suffered by IBM or other persons because wrongfully restrained by this order.

In the complaint also filed in California, Itel and AMS point to the Consent Decree and claim that by using the word "impractical," IBM "seeks to breach its maintenance agreements and to evade its responsibility" under the Consent Decree.

The complaint says that AMS has offered to attach its memory units in the same way that IBM increases the capacity of 360/30s to 96K under an RPQ, but that IBM won't sell AMS "certain hardware" that is "available as off the shelf items from IBM to any IBM CPU owner for use as repair or replacement parts. . . AMS attaches the memory units to increase capacity to 96K in functionally the same way as IBM. IBM does not offer memory units to increase 2030 CPU capacity beyond 96K." Thus, says AMS,

> IBM's said claim of "impracticality" is a sham. It is asserted to mask its design to drive from the marketplace all manufacturers and marketers of high capacity memory units so that IBM can market its Series 370 CPUs without fear of competition from Series 360 CPUs owned by others which are and can be enhanced by the addition of high capacity memories manufactured by others, and so that IBM can force end users requiring high capacity memories to obtain them from IBM at whatever monopoly prices and on whatever monopoly terms IBM chooses to exact.

The technical problem

When contacted about all this, IBM says that it has only had technical problems with users who have increased their computer's memory beyond what IBM of-

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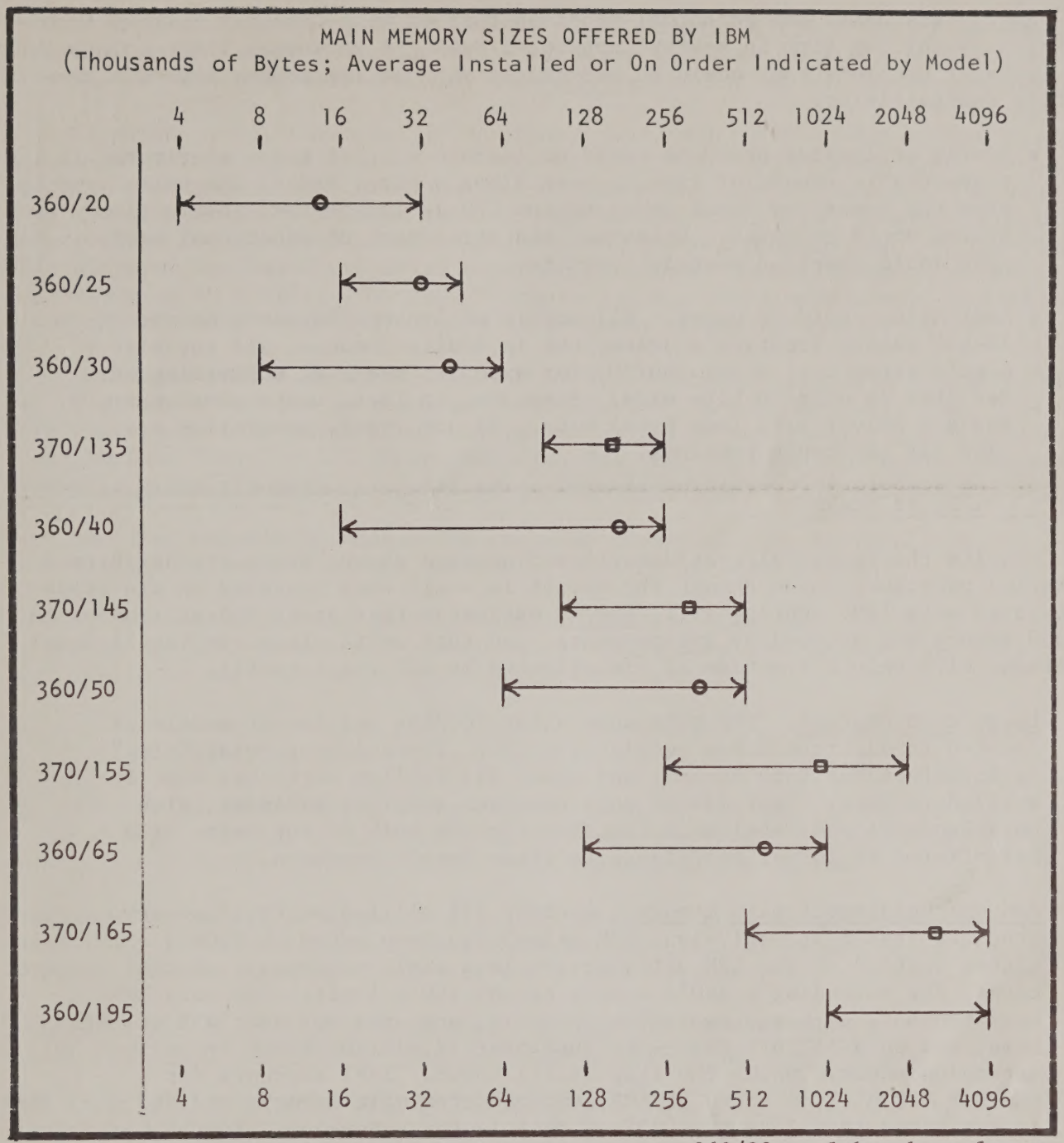

fers (see chart, above). Most of the cases are on 360/30s, although at least two 360/40 users -- with Data Recall units extending the CPU beyond 256K -- have also been notified by IBM that CPU maintenance is in jeopardy.

A memory addition beyond established limits "does not consist of separate circuitry and a box," IBM says. "The increase in memory capacity results from a deletion and addition of various parts, subassemblies, and wires inside the CPU." Indeed, Computerworld reports that the number of alterations to extend a 360/30 to 128K of memory will vary according to the number of selector channels on the specific CPU, but that typically 194 new wires would be added, 107 new read-only storage cards would be required, and up to four new SLT cards might have to be added. And in original cases where this was done, CW continues, IBM's 64K computer maintenance diagnostics could not be run on the altered machine.

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EDP/IR discussed the technical problems further with Computer Systems Architects, a consulting firm in nearby Cambridge, Mass. A spokesman there points out two types of problems that could be associated with adding memory beyond a computer's design limits.

- Timing or loading problems could be introduced. It takes electrons a measurable amount of time to move along a wire, and if the path from the memory to other parts of the CPU is lengthened, instruction timing could be upset. Likewise, the attachment of additional equipment could overload certain circuitry.

- Addressing could be upset. All models of System/360 can generate a 24-bit memory location address, but in smaller models, all the bits aren't wired up. A 64K 360/30, for example, needs an addressing adder that is only 16 bits wide. Some 30s, in fact, use a short-cut and are only 8 bits (one byte) wide. In any event, generating a 17th bit can cause problems.

What's really at stake

Despite the technical considerations discussed above, there are definite marketing overtones, even though the market is small when measured on the scale associated with IBM. During 1971, EDP/IR estimates that about $55 million worth of 360 memory was shipped by independents, and that splits into two fairly equal portions, with only a fraction of one affected by all the turmoil:

> Large core storage. The main memory for 360/65s and larger models is located in discrete boxes outside the CPU. There is a regular "plug" or interface for this memory, and about $43 million worth has been installed to date. Over 75% of this has been supplied by Ampex, with Data Products and Fabritek accounting for the bulk of the rest. IBM has offered no formal resistance to these memory products.
>
> Add-on/replacement main memory. Another $35 million worth of memory products (taken at equivalent IBM value) has been added to 360s . . . either instead of the IBM offering or, in a small percentage of the cases, for extending a 360's memory beyond IBM's limit. The Data Recall product, marketed exclusively by CIG, accounts for over 45% of this base, and only 15% of that -- or just over $2 million worth -- is in extension memory, which the flap is all about. Itel accounts for another $12 million worth of AMS semiconductor main memory, and it is estimated that less than 20% of this is for extension. Fabritek has "several" extension memory customers among its $4 million base, but none has been notified by IBM as to CPU maintenance problems.

But the size of today's installed base doesn't reflect the nature of the problem. About $30 million of the $35 million worth of main memory replacement/add-on products was shipped during 1971, and EDP/IR expects shipments of this type product to double during 1972. The bulk of shipments are to customers with 360s either owned or leased from a third party. Many of these customers, it is thought, would like additional memory without the expensive upgrade to a 370.

For many 360/30 users, in particular, the expansion above 64K is critical. IBM offers two alternatives: Move to a 360/40, or upgrade to a 370/135. Either of these courses would cost the user several thousand dollars a month in additional

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rental payments. The larger processor -- particularly a 135 -- would provide increased power, to be sure; but some users say all they need is more memory. Indeed, IBM virtually admitted this by starting the 135 at the 96K memory level.

It seems pretty clear to EDP/IR that a principle is at stake in this case. And it hinges on the definition of "impractical." It is certainly possible to operate smaller 360s with memories larger than those IBM will supply; the vendors report this is being done today. IBM, on the other hand, planned certain memory sizes for its models in System/360, and there's no question that part of this planning was based on marketing considerations. Today, however, there is a question as to whether IBM should have to retrain service personnel for expansions of System/360 when the company is actively marketing System/370.

CIG hopes that a hardware "switch" -- for returning computers to their "normal" state when service is required -- will solve its problems with IBM. Its primary concern at present is about the psychological effect the publicity will have. "Our greatest fear," a CIG spokesman says, "is that this will be misinterpreted to extend to other products. It does not affect other units."

And Itel apparently entertains the same feelings. In the complaint, it says it has already lost a customer because of the IBM letter, and that

- "potential users of AMS [360 and 370 memory] units will be unwilling to install any non-IBM memory units unless they are assured that they will be able to obtain maintenance for their CPU . . .

- "it will be virtually impossible to lease any such memory units, and [Itel Memory Equipment Corp.] will be driven out of business . . .

- "it will be virtually impossible to lease an IBM 360 Series CPU with a high capacity AMS memory attached" so "the entire CPU inventory of [Itel Computer Leasing Corp.] will be adversely affected."

Thus, another aspect of computer industry marketing goes to the courts for an answer. By the time this and other cases are settled, it seems likely that the computer industry will have a better set of definitions . . . if nothing else.

COMPUTER INDUSTRY GETS UNFAIR BACKWASH AS SPECIAL INTEREST GROUPS STRIVE TO PREVENT "EXPORT" OF AMERICAN MANUFACTURING AND SERVICE JOBS

This is an election year, with the economy and unemployment high on the list of crucial issues that will be discussed. It is almost natural that one or two of the candidates -- as well as various special interest groups such as labor unions and some consumerists -- will be taking a shot at U.S. business in general, the American-based computer manufacturers included. Actually, the computer industry should be singled out for praise.

BEMA's Data Processing Group (DPG) has just put together an eleven-page position paper called "Foreign Trade Issues Affecting the Data Processing Equipment Manufacturing Industry." During the period 1963 to 1970, the report points out, U.S. revenues from the export of computers and related equipment increased from $180 million to just over $1 billion. And during the same period the contribution of these exports to the overall U.S. balance of trade rose from about 3% in 1963 to over one-third in 1970. The following table, adapted from the U.S. Industrial Outlook 1971, summarizes the significance of data processing:

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Data Processing Group (DPG) Equipment: Trends and Projections 1963–70

(in millions of dollars)

Item	Description	1963	1967	1968	1969	1970
1.	DPG Value of Exports	189	433	486	728	1,017
2.	DPG Value of Imports	9	8	11	15	16
3.	DPG Trade Surplus	180	425	475	713	1,001
4.	U.S. Trade Surplus, All Industries	6,100	4,500	1,100	1,500	2,700
5.	DPG Contribution to Surplus	2.9%	9.4%	43.1%	47.5%	37.0%

BEMA points out that "despite the fact that our industry is expanding its exports each year and has consistently produced a growing trade surplus, and despite the fact that vigorous foreign competition is increasing substantially, we are experiencing:

- a lack of dialogue with our own government on crucial issues;
- unrealistic limitations imposed upon our foreign operations;
- severe restrictions on our exports to emerging and potentially profitable market areas.

"The significance of the table above is obvious, but of more importance to the future are the predictions based on reliable indicators. These predictions indicate that cumulative sales totals of U.S. based firms during the first five or six years of the 1970s will more than double worldwide, and will almost triple in the international marketplace, if supported by national policy."

EDP executives are frequently too occupied with their industry or their own company's growth to pay much attention to politics, but in this case, developments are worth careful observation. The computer industry may need relief for the continuation of these surpluses -- the BEMA document contains 11 specific recommendations -- but it certainly should not accept scorn for its past efforts. In the rush to accuse big multinational companies of shifting their manufacturing to the lowest labor cost spots in the world, critics have included IBM, Honeywell, Burroughs, and Sperry Rand on the "bad guy" list.

True, job raiding makes a good political issue. But the Hartke-Burke Bill -- introduced in both the House and Senate and cosponsored by 70 representatives and three senators -- could bring restrictions undesirable for the EDP industry.

Proponents of the Hartke-Burke Bill have unfortunately included the computer industry in rather broad-based accusations at multinational companies. Certain circuits and core planes undergo some assembly in areas such as Hong Kong, Korea, Mexico, or Ireland. but these operations constitute only a very small part of the industry's U.S. production, since IBM builds its own components in the U.S. for equipment to be used in this country.

But the facts speak for themselves. The computer industry has developed a unique role as a prime contributor to the balance of payments race, and industry executives should not hesitate to straighten out the facts.

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For the record

COULD YOU BREAK IBM UP IF YOU SHOULD AND HOW WOULD YOU?

That's the gist of several questions The New York Times was asking computer industry insiders and observers during the last few weeks. The consensus story -- well researched, thought provoking, and generally constructive -- appeared on Sunday, February 13.

Some of EDP/IR's comments were included. And so that readers will know what we said, our full statement to the Times is printed below:

The objective of establishing a more competitive computer industry will not be best served by breaking up IBM. Any dismemberment would be artificial, would damage the position of the U.S. in international commerce, and would not lead to more prosperity for IBM's competitors in the U.S. IBM is the only company in this country with the vast manufacturing capability necessary to form the backbone of computer shipments each year. There is simply too much inter-relationship among the elements of IBM to split it into separate companies. Also, a corporate fracture would damage its contribution to the U.S. balance of payments.

More competition in the U.S. can be achieved by the imposition of certain marketing restrictions on IBM. The Government, for example, could:

+ Forbid selected discounts by IBM;

+ Require a time delay -- perhaps of up to one year -- between the announcement of changes in pricing or marketing policy and their implementation. This would give competitors some breathing space and time for reaction.

+ Require IBM not to offer a lease of more than one year to data processing users. This would prevent reactive price adjustments and the locking in of customers.

If the U.S. Government desires to move further in helping competition in the computer industry, it could follow the inventive solution implemented by the Japanese government and sponsor the formation of a pool of capital for the purchase of data processing equipment to be rented to customers. Or, it could provide tax incentives and new accounting regulations that would encourage third parties -- including banks -- to do the same.

The computer industry is primarily a rental one, and should continue to be so. Otherwise, U.S. business and industry will not be able to take advantage of continual improvements. But many companies in the past have gone on the rocks because they were unable to amass the capital required to start up a rental base. Therefore, the Government could greatly stimulate competition by solving the deferred revenue problem that hinders the entry of new companies into the computer industry.

If readers have comments on this subject, we would be pleased to hear from them. Our space is limited, but will be made available as a forum for responsible spokesmen representing the interests concerned.

-- James Peacock, Managing Editor

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

ANAREN MICROWAVE INC.

Anaren Microwave Inc., 185 Ainsley Dr., Syracuse, N.Y., has filed 330,000 shares of common stock at $7 per share for expansion of its microwave component and subsystems business. Underwriter is Black & Co., Inc., New York, N.Y.

CAR/PUTER INTERNATIONAL CORP.

Car/Puter International Corp., 1603 Bushwick Ave., New York, N.Y., a computerized consumer information service firm, filed 100,000 shares of common stock on Jan. 31, 1972, for working capital in expansion. Underwriter is A. J. Carno Co., Inc., New York, N.Y.

CSM MEDICAL DEVICES INC.

CSM Medical Devices, Inc., 377 Putnam Ave., Cambridge, Mass., filed 100,000 shares of common stock under Regulation A for working capital in its production of special purpose devices for automating patient histories. Underwriter is I. J. Fischer & Co., Inc., New York, N.Y.

COMPUTER CONSULTANTS INC.

Computer Consultants, Inc., 1613 University Blvd., N.E., Albuquerque, N. M., filed on Jan. 31, 1972, for 1,000,000 shares of common stock priced at $4 for expansion of its proprietary computer software program business. The firm is handling its own underwriting.

DECISION DATA COMPUTER CORP.

Decision Data Computer Corp., 100 Winter Rd., Horsham, Pa., filed 600,000 common shares on Jan. 21, 1972, at a maximum of $15 per share. The company manufactures computer peripheral equipment, including 96-column card punch devices. Underwriter is Bache & Co., New York, N.Y.

INDECON INC.

Indecon, Inc., 300 South Wacker Dr., Chicago, Ill., a developer of computer programs and related services, filed 100,000 common shares on Jan. 31, 1972, at $5 per share. The underwriter is P & H Associates, New York, N.Y.

LEASCO CORP.

Leasco Corp., 280 Park Ave., New York, N.Y., filed on Jan. 28, 1972 for 125,089 shares of outstanding common stock to be offered from time to time at $19.875 per share. Proceeds are to selling stockholders, the underwriter is yet to be named.

McDONALD MICRADATA SERVICES INC.

McDonald Micradata Services, Inc., 259 Broadway, New York, N.Y., filed 130,000 common shares of Feb. 3, 1972 for expansion of its filming data processing and consulting services. The issue is priced at $1.50 per share through T. H. Lehman & Co., New York, N.Y. underwriters.

Q1 CORP.

Q1 Corp., 4 West 16th St., New York, N.Y., a manufacturer of small general purpose computer systems, filed 100,000 common shares at a maximum of $15 per share on Jan. 26, 1972. Underwriter is to be Philips, Appel & Walden, Inc., New York, N.Y.

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EDP industry report

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"THE GRAY SHEET" MARCH 3,1972 • VOL.7,NO.9 P.J.McGOVERN,EDITOR

ARPA COMPUTER NETWORK PROVIDES COMMUNICATIONS TECHNOLOGY FOR COMPUTER/COMPUTER INTERACTION WITHIN SPECIAL RESEARCH COMMUNITY

During the early 1960s, various research projects -- most of them funded by Arpa (the Advanced Research Projects Agency of the Defense Department) -- brought the phrase "timesharing" to the lips of computer industry buffs. This work paved the way for a business that will hit $400 million this year, up 33% over 1971.

Now, Arpa is quietly touting another concept -- resource sharing -- that may lead to vast extensions of the early timesharing concept. By tying together a large number of computers through communications "nodes" -- themselves little computers -- the Arpa researchers have come up with a new kind of network . . . a community of computers that share vast calculation power, massive data stores, and specialized software.

The system, called Arpanet, already contains over 25 nodes (chart, page 3) and is looking for more users. Its final impact on the computer industry is unmeasurable at this time, but could be significant; the concepts behind Arpanet reflect many ideas in the mainstream of advanced planning for distributed computing and data transmission. Similar systems could be built for immediate commercial use.

In a nutshell, Arpanet links together computer resources so that they are used at maximum efficiency. Three aspects are involved:

- Load sharing brings a wealth of computer power to Arpa researchers on demand. Weather Bureau scientists can use the Sigma 7 at UCLA; MIT students, if they overload the school's PDP-10 during peak morning hours, can access a similar machine at Utah for the overflow, with the reverse possible after lunch to smooth the system load.

- Data base sharing prevents duplication of efforts. All researchers have access to the massive data bases generated at other sites, and this capability will increase next year when Illiac IV and its trillion-bit store join the network.

- Software sharing cuts one of the most significant costs in using a computer, and will provide transfer of human skills. Arpa researchers can access any specialized software on any system rather than develop their own or adapt it to suit a particular type of hardware.

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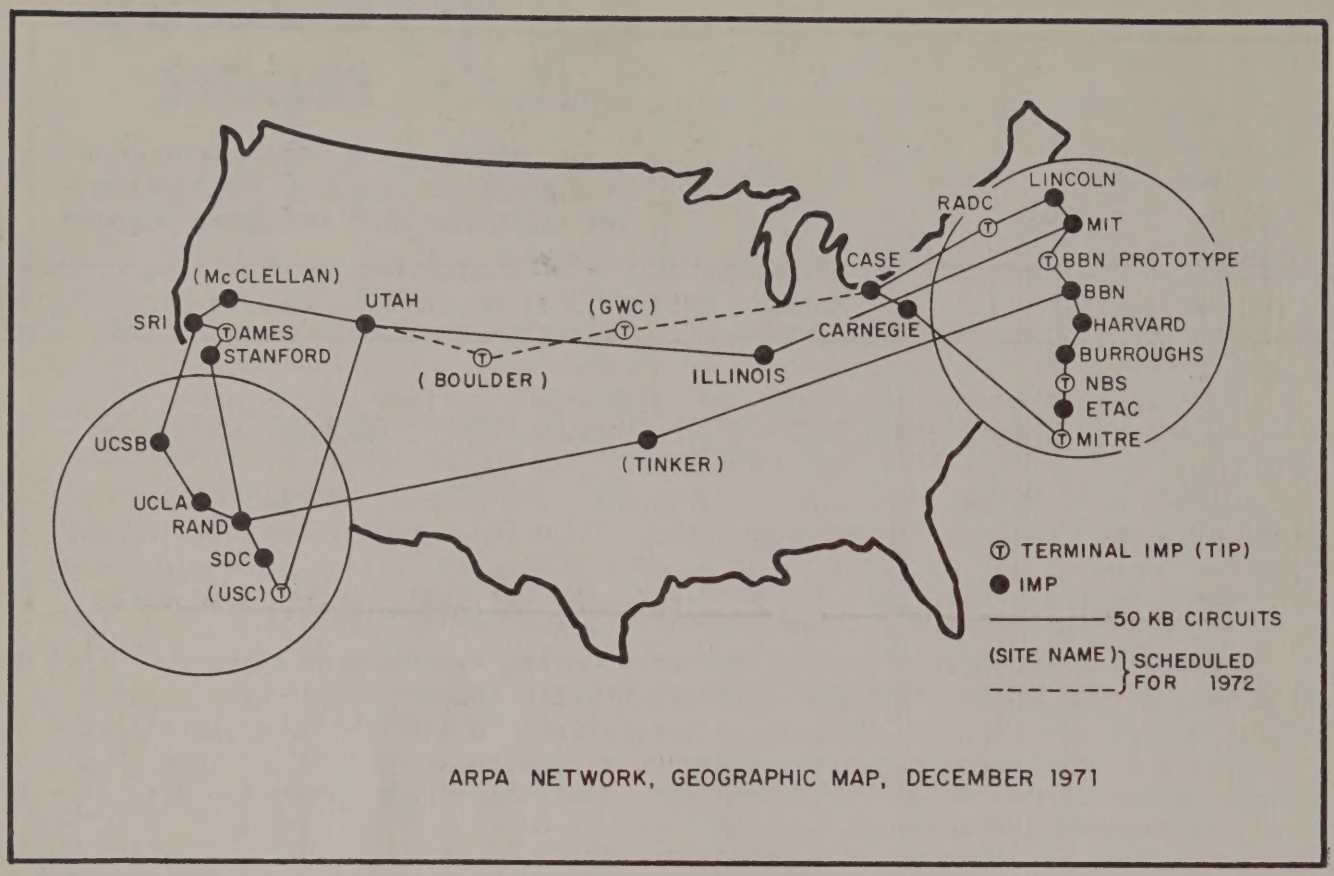

ARPA NETWORK, GEOGRAPHIC MAP, DECEMBER 1971

With such an interconnected system, virtually all the independent research efforts to advance computing in the U.S. are brought together under one roof, as it were, and will have a common orientation. No duplication of effort will be required. Yet all researchers interested will be able to access a one-of-a-kind machine such as Illiac IV, which joins the network next March, or work together on a common language for the system. This fusion of human efforts combined with almost human communication between machines is what Arpa means by resource sharing.

How Arpanet works

As the map above shows, Arpanet is a closed circuit network of 50 kilobit communications lines that connect over 25 research centers across the nation. Interconnection by conventional means would have required separate lines between each pair of nodes -- in a "star" fashion -- and the failure of any single line would have isolated those two nodes from each other. With just 40,000 miles of data transmission pipeline, however, Arpanet virtually guarantees communications capability between any two nodes at all times. If one link is unusable, another route always exists; it is located automatically by an element of the system.

The heart of the network is the node, and the network has many hearts. This little computer called an IMP (Interface Message Processor) receives and transmits messages according to a standard set of rules called a protocol. The IMP results from the system store-and-forward technology developed by Bolt Beranek and Newman Inc., also one of the timesharing originators. The node hardware is based on a Honeywell DP-516 or DDP-316 minicomputer that is modified, installed, and maintained by BBN. Each of the IMPs, priced at $60,000, contains the system rules, or protocol, and they reload each other in the event of failure or removal from the communication network for maintenance.

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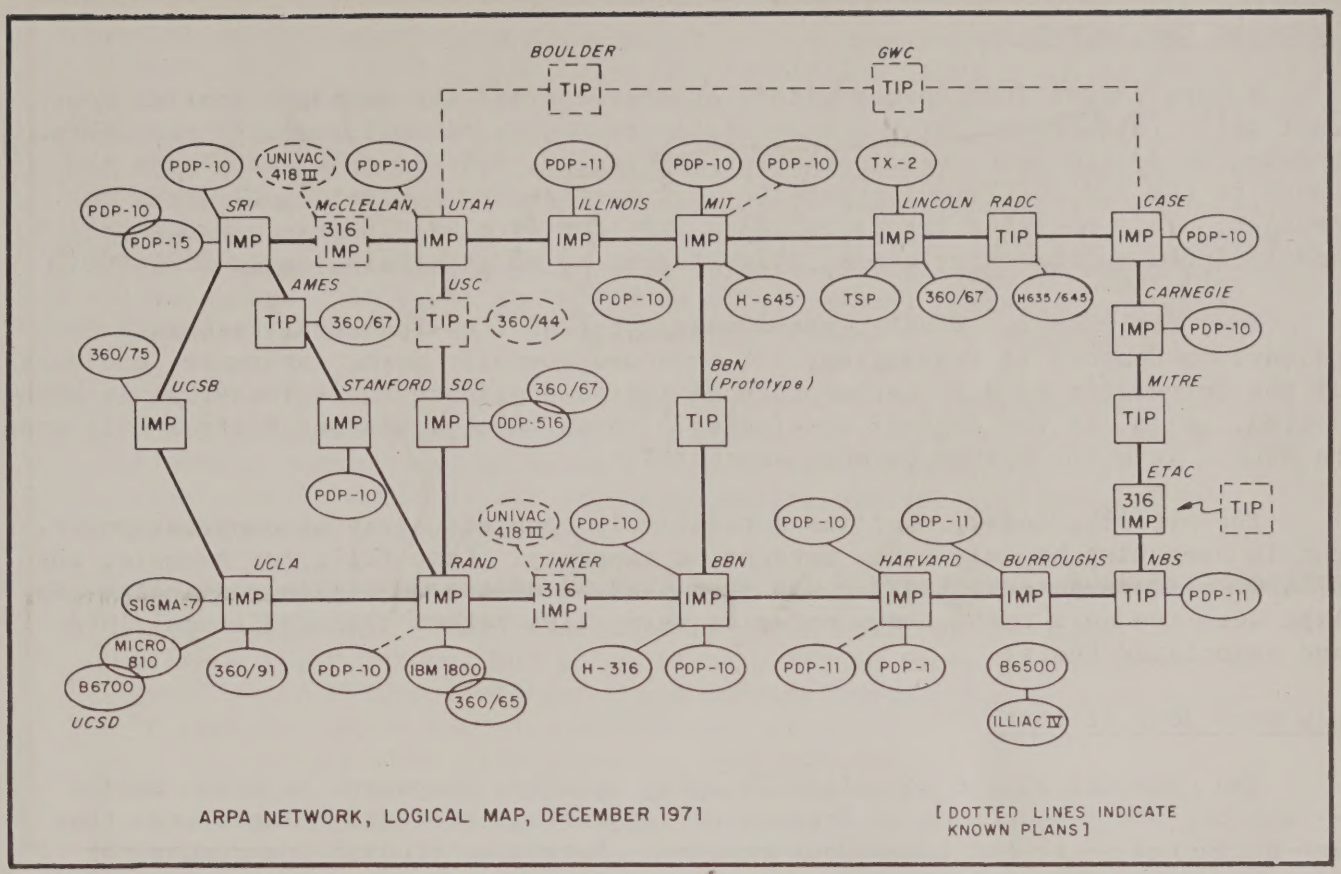

The IMP is what actually connects the computers (Hosts) to the network. If a researcher at Carnegie, for example, wants to access a data base at Rand, his Host PDP-10 must transmit an appropriate message to its IMP. The IMP, in turn, acknowledges receipt of the message, translates it into a standard code, selects the fastest route -- considering the distance involved, the status of the lines, and load factors along the way -- and transmits the message to the next IMP in the route.

As the message proceeds to its destination, each intermediate IMP tells the previous one the message was received. Then, it checks the selected route to make sure it is still the best way to the final destination, and continues the transmission process. Ultimately the message arrives at its destination. In this example, for instance, the final IMP decodes the message and transmits it to the Rand Host. That Host then starts a confirmation message on its way back to the Carnegie Host to acknowledge receipt.

Amazingly, this entire process takes no more than 0.2 seconds. In fact, when the system was demonstrated to EDP Industry Report at the BBN control center recently, we saw no noticeable difference in transmission time from one Host to another. It didn't seem to matter whether we interacted with a Host in Utah or the Project MAC computer center down the street at MIT in Cambridge. The only apparent delays stemmed from complex operating systems in the Host computers themselves.

The coding and decoding tasks performed by the IMPs are no small feat. In fact, it is precisely for this reason that so many different types of computers can participate as Hosts. The schematic above gives some indication of the enormous complexity of the system; each different Host -- from Burroughs, DEC, IBM, XDS -- communicates in a different code. The IMP simply doesn't care.

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Bring on the terminals

A more recent development within Arpanet extends the resource sharing concept still further and opens the available resources to multitudes of new users. Working as development coordinator for the system, Bolt Beranek and Newman has added to the IMP sufficient capability for interfacing a terminal directly to Arpanet. This modified IMP is called a TIP (for Terminal Interface Processor) and includes multiplexing capabilities for up to 63 terminals, costs $120,000.

Now, for example, weather researchers at ETAC (Environmental Technical Applications Center) in Washington, D.C. can use computer power, software, and data at the University of Utah rather than having to duplicate these resources in Washington. Also, as the logical map (page 3) shows, Global Weather Central will soon be hooked into the system through another TIP.

The network, today, contains a relatively complete array of computer power, but is operating at only a few percent of capacity. Last fall, for example, the 675,000 message-per-day traffic was just over 2% of the 30 million capacity. So Arpa sees the next rash of new nodes as being TIPs rather than additional IMPs and associated Hosts.

How much does it cost?

The greatest single advantage in tying together computers in this fashion -- whether for research as in Arpanet or for certain business-related uses that are projected -- is the tremendous economy. Extensive studies undertaken for Arpa show that the capacity and cost of such distributed networks are "remarkably insensitive" to the distribution and destination of traffic. The total traffic is the only important parameter. Thus, says Arpa, "it is appropriate to charge for traffic initiated at a node, based on the cost of increasing the total capacity of the network by that amount." Charges, thus, could be much like those of the Postal Service, with message length (weight) more important than distance.

At present, an equal share of the communication line cost is being allocated to each node, so the cost for Arpanet users is about $4,800 per node per month -- $3,100 for communications and $1,700 for leasing a minimal IMP. Use of a TIP increases the cost by $1,600 a month.

But this will change. As soon as feasible, Arpa plans to charge for traffic initiated at a node. The actual charges will depend on the loading that can be expected for the system, since it will naturally not operate at peak capacity day in and day out. Arpa's target rate, based on 36% loading, is an estimated 30¢ per megabit in addition to equipment rental.

A few problems

As can be expected for any new development in computing, a number of problems -- legal, technical, and human -- will prevent this concept from mushrooming full bloom into a series of networks connecting most of the computers in the country. Five or ten years down the pike, however, significant changes in computer system organization are expected. And in the light of such a timetable, the anticipated problems don't seem insurmountable. In fact, they are quite similar to those already being faced by a number of computer users and, because of the resource sharing concept, if they are solved once, they are solved for all. Some of today's "challenges" are:

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- Computer/communications interrelationships have been studied exhaustively by the Federal Communications Commission (EDP/IR Apr.9,1970), but all the questions weren't answered. It would appear the Arpanet would be what the FCC calls a "hybrid" system -- "an offering of service which combines Remote Access data processing and message-switching to form a single integrated service." Such systems, the FCC says, need be regulated if and only if message switching is the main purpose of the system and data processing is an incidental and integral part of the system. It looks to EDP/IR as if additional definition -- or at least a firmer ruling -- will be in the cards.

- Host-Host protocol is an on-going research project within the Arpanet members to allow graphics, block transfer of data, and file transfers. A common macro language doesn't seem to be necessary at this point in time, but it would appear necessary before similar systems gain widespread commercial usage.

- The privacy question will likely raise its head high as vast networks are established. The Arpanet really doesn't affect the invasion of privacy issue per se, but it could be a strong factor in bringing the question to the surface faster and forcing answers sooner than would be expected under current conditions.

- On the other hand, the sharing or resale of common carrier facilities cannot be done for profit. Thus, if several service organizations such as Control Data, GE, and Tymshare set up a jointly owned network (see below), provision for this current FCC requirement might be a problem.

The potential impact

As suggested earlier, many commercial "communities" today have characteristics and needs for which an Arpanet-like linkage might be useful today. There's no question but that some of these will evolve:

The timesharing industry itself could gain two primary advantages from setting up a jointly-owned system:

+ The network could provide a highly reliable communications system for interconnecting remote locations and central computers;

+ By mutual agreement, services within the network could draw on each other's powers and resources for backup and a more complete spectrum of service capabilities.

The large service companies mentioned above have their own private communications networks, but smaller companies cannot afford the luxury of such mammoth development efforts or the full time broadband communications links required. Also, even for these large companies, individual networks do not operate at nearly the efficiency that Arpanet sees right now.

Inter-airline reservations would be greatly simplified by interconnection through an Arpanet cousin. If one airline could not supply the requested seat, it could automatically query the network to find out who could do it, then write the ticket and perform the appropriate accounting transactions . . . all without any further human intervention.

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Hospital patient records become increasingly dispersed as American society becomes more mobile. The Arpanet concept, however, provides a means for any participating hospital to query all other hospitals until a given patient's records are found. The local Host could then update the records on the remote Host rather than duplicating storage.

Inter-library lending systems could extend the resources of the nation's numerous libraries far beyond their present limits. Many companies have small, specialized libraries and draw on others for information they do not maintain themselves. At present, however, a librarian in one of these organizations must search manually for a library that has the publication required. A computerized network of library catalogs could track down the appropriate material far more quickly and efficiently.

Federal and state governments have numerous applications for which such a network could cut computer investment and line charges significantly. Some initial efforts at cooperation -- such as between motor vehicle bureaus -- are underway, but many other areas haven't even been considered.

Looking more than a few years into the future, EDP/IR can forsee even the possible specialization of computers by function. Certain computers, for example, might perform only payroll calculations for all network participants; another network might keep track of corporate shareholder records; and a third might automatically compute everyone's income tax and bill the individual for the amount due. Many of these would work with banks in the transfer of money. Arpa has expressed similar possibilities for the selection of computers:

> Soon after a network with a dozen or more reliable computer services becomes available, many institutions will find it far more economic to obtain their computing services from a selected set of these remote systems, rather than run their own computer center.
>
> For example, take the case of an institution about ready to upgrade its facility. One choice would be to obtain a medium scale, general purpose batch system, admittedly a compromise for their large numerical users and timesharing users, but the best single system that they can afford. Alternatively, they could buy no new machine and obtain access to several of the systems on the network through a TIP. This approach permits their large numerical users to use a large "number-cruncher," their statistical and payroll users to access a large scale general purpose system, and their interactive users to have Teletype or graphic console access to a good timesharing system. Overall the cost of each service is less than it would have been on a dedicated G-P computer by factors of between two and ten. Also, they can buy just the capacity they need and expand smoothly rather than having to pay for an oversize machine for a year or two.

That's hardware sharing, and the same type of advantages are expected from data base sharing and software sharing. Once these are going, says Arpa, there will develop other important network applications, "all of which require a large viable network before they become important in their own right. These include teleconferencing, publishing, library services, and office paperwork filing and distribution. Ten to twenty years from now these applications may well dominate computer usage and network usage but they are not likely to be important factors for at least five years." EDP/IR, along with Arpa, is convinced this is the wave of the future. And, in their petty pace, things are headed in this direction.

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GENERAL-PURPOSE COMPUTERS CONCENTRATED AT LARGEST SITES IN THE UNITED STATES

With all the talk of "saturation" that goes around from time to time, EDP/IR asked the International Data Corporation, its publisher, to compile some relevant data. The figures below for general-purpose (Group A) computers only are based on the January, 1972 U.S. Computer Installation Data File maintained by IDC. Figures for tax reporting units -- plant sites for industrial companies -- are extrapolations based on 1968 data from 1970 Statistical Abstracts, U.S. Department of Commerce. This is the latest data available to IDC at presstime.

No. Employees per tax reporting unit	Estimated No. of reporting units	Estimated % with 1 or more computers	No. of sites with one or more computers	Estimated total No. of Group A computers
1- 19	3,260,000	0.05	1,630	1,630
20- 49	276,000	1.25	3,450	3,620
50- 99	95,400	4.7	4,500	4,950
100- 249	54,500	15	8,290	9,810
250- 499	17,550	46	8,000	10,215
500- 999	7,110	75	5,330	7,460
1000-2499	3,620	90	3,260	6,520
2500-4999	935	98	915	2,745
Over 5000	422	99.5	420	2,100
SUBTOTAL	3,713,537	0.96	35,795	49,050
Federal Government			1,325	3,585
State & Local Government			2,310	2,725
TOTALS			39,430	55,360

The figures above indicate that, on average, there are 1.4 general-purpose computers per site in the U.S. That average is slightly misleading, however, because 75% to 80% of all the sites have only one computer. The remainder, as a result, have almost 3 computers per site.

And this computer concentration is even more pronounced when the fact that some companies have many sites is considered. Because of this concentration some 40% of the computers in the U.S. are operated within only 700 or so organizations. Thus, as would be expected, computers follow wealth and high employment. The figures above indicate this concentration: Even though just under 1% of all tax reporting units have a computer, the penetration jumps to about 8% when the first category -- one-to-twenty employees -- is eliminated from the averages.

There are many opportunities for installing small computers at the number of small tax reporting units without EDP. But the way in which vast numbers of these organizations will receive computer power is probably going to be via terminals connected to a network of some sort. This is one more reason why commercial operations such as the one now up-and-running for Arpa researchers (page 1) will be so important. And other factors point in this direction. Shipments to new users accounted for about one-third of all computer deliveries during the mid-1960s; but these peaked in 1968 and 1969 -- at $1.2 billion -- and have started to decline in value as well as percentage. By the mid-1970s, shipments to new users in the U.S. will be less than 10% of the total, according to IDC projections.

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IBM'S NEW COMMUNICATIONS CONTROLLER/PROCESSOR HAS EXTENDED-TERM LEASE PLAN

In a move that further suggests its commitment to communications, IBM this week announced a controller "with its own processor for improved remote computing." The device -- called the 3705 -- is available for shipment this summer, and it is being offered "under terms of a new IBM extended term plan." Thus, in a single announcement treated routinely, IBM has eliminated a weak link in its product line and started people talking again about the possibility of IBM's offering term leases for additional products -- including mainframes.

All IBM will say about the new extended-term lease plan is that "we expect to announce the ETP to other products, but we will make that decision as the products come along. At present, we have no plans to add announced products to long term leasing plans."

The plan provides for discounts of about 13% off the regular month-to-month rental contract for the product. It provides for an initial 24-month contract and gives the user the option of an unlimited number of one-year extensions of the contract. And since communications systems are normally installed at considerable expense and planning, the two-year minimum would seem academic.

The new product will meet "growing requirements for more flexible and reliable teleprocessing operations." A "combination of logic circuitry and core memory," the 3705 is not dubbed a computer by IBM. But it will fill a gap that many IBM users, with the airlines at the van, have gone to minicomputer manufacturers to supply. IBM says it will take over the task of controlling the access of data to and from terminals in a network, thereby relieving the central computer of routine tasks such as communication line control, character checking, and buffering and line polling.

The 3705 can handle up to 352 communications lines, twice as many as the 2703 it replaces. It can handle line speeds ranging from 45.5 bps to 50,000 bps, and can support both asynchronous or binary synchronous transmission. The basic unit consists of a processor with 16K bytes of core memory. This can be expanded in 32K increments up to 240K bytes, or characters. The ETP charges range from $1,200 to $9,500 a month, compared to monthly charges of $1,390 to $10,940 under the shorter-term plan. Purchase is $57,000 to $449,000.

There is nothing very new, technically, about the 3705. Some observers have suggested that it is another home for the memory and logic circuits from 360s being returned by 370 customers. In any event, it broadens IBM's communications offerings and could cut into business previously received by Honeywell or Interdata from customers with 360-based communications systems.

AT&T SAYS DATA TRANSMISSION IS ITS FASTEST GROWING BUSINESS AT 50% A YEAR

The 1971 annual report just published by American Telephone & Telegraph Company contains a good deal of talk, and some figures, about the data communications business as seen by the giant. "Data transmission -- on private line channels and on our general message network -- continues, as it has for some years, to be our fastest growing service. It brought in revenues of some $650 million in 1971 -- and market studies project a ten-fold increase in the decade ahead." AT&T's revenues from "data services" grew 18% last year, according to a table in the report, versus the 21% and 25% figures posted in the prior two years. The compound rate for the last ten years has been 26% annually.

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Review and Forecast

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" MARCH 30,1972 • VOL.7,NO.10 P.J.McGOVERN,EDITOR

Coming of age

SHIPMENTS TURN UPWARD AS NEW INDUSTRY GROWTH PATTERN EMERGES

After several pretty "flat" years, a spark of life re-entered the computer industry during late 1971. And it looks like a harbinger of things to come. Mainframe shipments will be up over 20% this year and another 17% or 18% in 1973 before settling down to the "comfortable" 13% level for the mid-1970 period.

The business mix will be much like old times: Hardware in the forefront; mainframes setting the pace; the U.S. pacing the world. About the only change from the mid-1960 upsurge is that much of the hardware will be communications oriented as the country steadily prepares for an era of distributed processing.

During the past several months, the International Data Corporation has been surveying users, talking with manufacturers, and generally attempting to measure near-term demand for computer hardware. The results, presented in this Review and Forecast issue of EDP Industry Report, are most encouraging. Some highlights of IDC's studies are as follows:

- Shipments of computer hardware -- including mainframes, minicomputers, and plug-compatible peripheral equipment -- reached $7.6 billion in 1971, a new high.

- In the U.S. this year (1972), general purpose computer shipments will zoom 30% to $5.3 billion, breaking the previous high level set in 1968. IBM will be the principal beneficiary as worldwide shipments head for the $9 billion level.

- During the next five years, sparked by the 1972 performance, worldwide shipments by U.S. manufacturers will more than double, rising to the $16 billion level by 1976.

- During the same five-year period, worldwide revenues to U.S.-based companies in the computer industry will grow similarly -- from the $12.5 billion level hit in 1971 to $27 billion in 1976.

- Even so, the fastest growing segment of the computer industry during the first half of the 1970s will be on-line services, conservatively forecast to go from $330 million in 1971 to nearly $2 billion by 1976.

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All in all, it looks as if the doldrums have ended and the computer industry has prospects for a new growth cycle. During the last three years, the end of one product marketing cycle hit smack in the middle of a recession; then, customers were offered much more bang for few if any more bucks. But by early 1972, increased business activity has absorbed most of the oversell of the 1960s; extreme cost-cutting pressure is abating; and new applications need implementing. There's now room for growth as the information processing industry comes of age.

A year of modest accomplishment

The economic recession turned out to be more severe and have considerably more effect on the computer industry than EDP/IR realized at this time last year (EDP/IR Mar.12,1971). Indeed, when looking back at previous industry forecasts and comparing them with what is now expected (page 10), we get the feeling that somehow just about a whole year has been yanked out of the series.

But 1971 ended on an upbeat, with shipments up 7% to the highest level ever. In the U.S., however, a large portion of the equipment shipped to customers was for "modernization," to use capital goods terms. EDP/IR estimates that $1.85 billion of computers -- some 45% of 1971 shipments -- were retired in the U.S. last year. This will drop to less than $1.5 billion in 1972, however, and over the next five years something less than half today's $24 billion domestic base will be retired. Thus, after 1972, retirements are expected to run about 30% of new equipment shipments.

It was IBM's heavy System/370 shipments, replacing older computers, that accounted for most of 1971's increase, in fact. The other manufacturers, taken as a group, were up only 2% last year, and only one major mainframer -- Burroughs -- exceeded the industry average with a 12% increase. In the table (below) that shows how the major companies did during 1971, the plug-compatible independent equipment manufacturers have been included since collectively they represent as large a force as the other mainframers. The value of their equipment is calculated at the list price for the IBM equipment which it replaces.

STATUS OF WORLDWIDE COMPUTER MARKET FOR U.S.-BASED MANUFACTURERS

	1971 Shipments: $M	1971 Shipments: % Total	1970-71 % Change	In Use Yearend 1971: $M	In Use Yearend 1971: % Total
IBM	4,711	61.6	+ 8	28,730	67.2
Plug-Compat.	369	4.8	+31	769	1.8
HIS	618	8.1	+ 1	3,902	9.1
Univac	474	6.2	+ 2	2,311	5.4
RCA	233	3.1	-12	948	2.2
Burroughs	434	5.7	+12	1,838	4.3
NCR	293	3.8	+ 3	875	2.1
CDC	193	2.5	- 7	1,588	3.7
DEC	120	1.6	+18	539	1.3
XDS	54	0.7	-13	440	1.0
Others	144	1.9	+40	791	1.9
TOTALS	7,643	100.0	+ 7	42,731	100.0

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The big shocker in computeryear 1971, of course, was RCA's withdrawal from the mainframe business (EDP/IR Sept.29,1971) and the subsequent purchase of its North American installed base by Univac. Because of this, the RCA figures on page 2 are shown adjacent to those for Univac and they will be combined from now on. The news of RCA's demise caused an initial round of shock waves through much of the computer industry. Things have quieted down quite quickly, however, and we continue to believe that RCA's withdrawal was simply that, not an evil omen of things to come.

The biggest story of 1971 was IBM's price cut and fixed-term lease announcement (EDP/IR June 2 & Aug.31,1971). With this one bold move, IBM underscored the flexibility and aggressiveness of its marketing policy while tightening the lock on its customer base and checking the almost rampant "intrusion" that was being made by the independent peripheral manufacturers. Also, in light of the recent extended term pricing plan (EDP/IR Mar.3, 1971), this announcement may have signaled IBM's acceptance of longer-term leasing for the computer industry.

Otherwise, 1971 was considered by many a good year to be past. Events forced industry managements to tighten their belts and pay more attention to reality. As a result, much of the day-to-day mystique and aura of glamor fell away. At the same time, users were forced to reassess their computer operations. In so doing, user management became a little more aware of what computers are all about. Interestingly, this awareness will work well for the computer industry in the years ahead. Backed by management, more and more users will begin implementing new applications that require additional computer equipment and services.

The slope of the curves

The tables on pages 4, 6, 8, and 10 are based on the specific and continuing studies undertaken by the International Data Corporation. They are presented to indicate relative growth rates, market sizes, and the general philosophy behind IDC's projections. Most of the columns of numbers are summaries of detailed studies; they should be examined as such.

The terms used in the first three tables are those normally used by EDP/IR in discussing the computer industry. The most important ones are:

Cumulative value -- The value of the equipment under discussion, calculated at original purchase price.

Shipments -- -- Newly built equipment (excluding that returned, refurbished, and reshipped) valued at original purchase price. The value of shipments include new add-on core and peripherals to existing users.

General-purpose computers (Group A) -- Byte or character oriented computers, plus large word-oriented scientific machines (in IBM nomenclature, all models except 1800 and System/7). Predominately rented.

Dedicated-application computers (Group B) -- Systems which, although general-purpose in processor design, tend to be used for specialized (usually non-business) applications. Predominately purchased. This category includes all minicomputers and medium-priced process control computers. Does not include special aerospace computers, which are not included in any of the data here.

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TABLE I

WORLDWIDE COMPUTER MARKET
(U.S.-BASED MANUFACTURERS)

	Number Systems Shipped	Cumulative Number In Use	$ Million Value Shipped	Cumulative $ Billion Value In Use
		TOTAL		
1966	11,000	46,200	$ 4,005	$ 15.1
1967	13,850	62,240	5,490	19.7
1968	17,700	75,800	6,815	25.3
1969	21,530	92,870	7,349	31.5
1970	22,810	109,350	7,145	37.6
1971	26,830	132,395	$ 7,643	$ 42.7
1972	36,900	165,300	9,490	49.8
1973	45,400	205,600	11,090	57.9
1974	53,100	248,940	12,560	66.9
1975	63,700	300,700	14,275	76.7
1976	75,250	357,200	16,160	87.5
		GENERAL-PURPOSE COMPUTERS (GROUP A)		
1966	9,500	41,000	$ 3,895	$ 14.4
1967	11,100	53,340	5,315	18.8
1968	13,300	63,400	6,575	24.2
1969	13,430	72,570	6,992	30.1
1970	11,610	78,950	6,768	35.8
1971	15,230	90,695	$ 7,328	$ 40.7
1972	19,900	108,500	9,025	47.4
1973	24,100	129,600	10,550	55.0
1974	28,100	152,440	11,930	63.4
1975	33,000	177,700	13,535	72.7
1976	38,750	204,700	15,300	82.9
		DEDICATED-APPLICATION COMPUTERS (GROUP B)		
1966	1,500	5,200	$ 110	$ 0.7
1967	2,750	7,900	175	0.8
1968	4,500	12,400	240	1.1
1969	8,100	20,300	357	1.4
1970	11,200	30,800	377	1.8
1971	11,600	41,700	$ 315	$ 2.1
1972	17,000	56,800	465	2.5
1973	21,100	76,000	540	2.9
1974	25,000	96,500	630	3.4
1975	30,700	123,000	740	4.0
1976	36,500	152,500	860	4.6

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In general, as the numbers opposite show, IDC expects the installed base of computers made by U.S.-based manufacturers to grow an average of 15% a year over the next five years, in contrast to the 23% annual growth rate (on average) for the preceeding five years. The installed base is the single most important measure of the computer industry:

+ It shows the manufactured value of computers in use, and therefore is a minimum relative measure of computer power, since throughput per dollar costs less each year;

+ Its growth is directly related to revenue growth for companies in the industry, since 60% of all U.S.-made general-purpose computers (by value) are on rental and producing a yearly revenue of about one-fourth their value;

+ Its size determines how shipment growth will affect installed base growth. Thus, the International base will grow somewhat faster (18% vs. 14%) than the U.S. base on similar shipment increases (16%) during the next five years because the starting point is lower.

"OTHER" MAJOR MAINFRAMERS HAVE MIXED PROSPECTS IN IBM SHIPMENT WAVE

The shipment pattern shifted in 1971 as heavy production of IBM System/370 computers began. Rather than outperform IBM in percentage gain as they had during the two prior years, the other mainframers, as a group, had virtually no shipment increase. The results for individual manufacturers, of course, vary widely. And in 1972, the pattern of last year will be repeated, although few if any of the other mainframers have the retirement problem that continues to bother IBM.

The general mainframe picture, and IBM's relation to it, has been reviewed earlier in this issue. The other seven mainframe manufacturers will play second fiddle to IBM again this year. Here is a quick rundown on their prospects.

Honeywell Information Systems spent much effort last year consolidating the merger with General Electric's computer interests. All in all, this has been done effectively: An efficient worldwide operation, with fewer employees, managed to increase shipments slightly despite incompatible product lines. The new 6000 series (EDP/IR Nov.12,1971) has been well accepted and brings a significant contribution to HIS's installed base -- over 20% of some 100 orders are for purchase, and there is relatively little netting problem.

The 2000 series gives HIS a similar price-performance improved computer in the medium-size product category (EDP/IR Feb.8,1972). It should be able to fill HIS's gap until a truly new product line is introduced, and that probably won't be until late 1972, at the earliest. That would mean late 1973 deliveries at the earliest. Shipments during 1972 -- with the 6000 leading the way -- could be up 10% or so to just shy of the $700 million level.

Univac eked out a small shipment increase for 1971, but its most significant activity was the acquisition of RCA's North American base of installed computers. It hopes to keep a large portion of this almost $1 billion base, but EDP/IR expects Univac to retain no more than 40% of the $600+ million rental base over a three-to-five year period. The remainder will return to IBM or be picked off by other mainframers. The 9700, announced during 1971, will be Univac's main offering for the RCA base.

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TABLE II

GENERAL PURPOSE COMPUTER MARKET (GROUP A)
(U.S.-BASED MANUFACTURERS)

	Number Systems Shipped	Cumulative Number In Use	$ Million Value Shipped	Cumulative $ Billion Value In Use
		WORLDWIDE		
1966	9,500	41,000	$ 3,895	$ 14.4
1967	11,100	53,340	5,315	18.8
1968	13,300	63,400	6,575	24.2
1969	13,430	72,570	6,992	30.1
1970	11,610	78,950	6,768	35.8
1971	15,230	90,695	$ 7,328	$ 40.7
1972	19,900	108,500	9,025	47.4
1973	24,100	129,600	10,550	55.0
1974	28,100	152,440	11,930	63.4
1975	33,000	177,700	13,535	72.7
1976	38,750	204,700	15,300	82.9
		UNITED STATES		
1966	6,500	30,000	$ 2,760	$ 10.2
1967	7,600	35,600	3,815	13.3
1968	9,000	41,400	4,650	17.0
1969	8,450	46,570	4,642	20.8
1970	5,300	48,450	3,948	24.1
1971	8,500	54,470	$ 4,074	$ 26.4
1972	11,400	64,000	5,303	30.3
1973	13,800	75,200	6,220	34.7
1974	15,500	87,940	6,883	39.4
1975	17,600	101,700	7,695	44.7
1976	20,000	115,800	8,550	50.4
		INTERNATIONAL		
1966	3,000	11,000	$ 1,135	$ 4.2
1967	3,500	17,740	1,500	5.5
1968	4,300	22,000	1,925	7.2
1969	4,980	26,000	2,350	9.3
1970	6,310	30,500	2,820	11.7
1971	6,730	36,225	$ 3,254	$ 14.3
1972	8,500	44,500	3,722	17.1
1973	10,300	54,400	4,330	20.3
1974	12,600	64,500	5,047	24.0
1975	15,400	76,000	5,840	28.0
1976	18,750	88,900	6,750	32.5

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The large 1110 experienced additional delays, and deliveries won't start until May. A small computer in the System/3 size class is expected, but neither it nor the large machine offer much chance for shipment gains this year. So unless there's a significant boost from Federal spending, Univac's 1972 shipments will probably be a little below the $474 million chalked up in 1971.

Burroughs solved its 6500 problems last year, and had the best record of any of the major mainframers, with shipments up 12%. And as 1972 progresses, the question is when rather than whether the smaller processors in the Burroughs 700 family will be announced. But they can hardly have much impact on 1972 results.

Burroughs large 6700 computer is going smoothly, but the first-year shipment bulge is past. Another shipment increase of about 10% is expected, but the figure will probably be less than $500 million. Air Force Phase II shipments have about ended, and other purchase business is down; thus, Burroughs did not have a 1971 revenue increase on par with its shipment increase.

NCR is going through the second stage of its current product line cycle. As a result, Century 100 and 200 production is off, but dollar shipments are up somewhat because add-on memory and peripherals are being shipped to existing customers. This trend should continue until the "swing" processor is announced (see below) and it will be hard for 1972 shipments to exceed those of 1971.

Terminals remain a bright spot in NCR's product line, with the retail terminal going very well. Earlier this month the company announced its 399 terminal computer, and this product should help NCR's business the way the TC-500 helped Burroughs.' It contains a specially built minicomputer, and can operate in stand-alone mode or on-line to a larger Century or to an IBM mainframe. This product should help start NCR's smaller accounting machine customers thinking about computers, and will fit in well with the distributed processing concept inherent in NCR's cooperative mainframe project with Control Data (EDP/IR Feb.8,1972).

The name of the jointly owned company announced earlier this year by NCR and CDC is Computer Peripherals, Inc. It will engineer and manufacture punched card equipment, magnetic tape equipment, and high-speed printers for sale only to the two parent companies. Headquarters will be in Edina, Minn.

Control Data had a reasonable increase in computer-related revenue last year even though hardware shipments were off about 7%. More than half its revenues are in various services such as maintenance, software, education, and Cybernet. There are a couple of orders for the company's supergiant Star computer (EDP/IR Nov.12,1971), and some international activity for 6000 (Cyber 70) computers. But EDP/IR expects another shipment drop of 10% to 15% for 1972. Revenues should be up, of course, since the rental base has grown and service is becoming such a large factor in the company's business mix.

Digital Equipment Corp. made quite a to-do about its DECSystem 10 general-purpose computer line last fall (EDP/IR Sept.29,1971), but the great bulk of its business last year was from minicomputers. It was probably the only large manufacturer that benefitted much from the investment tax credit, and its 18% shipment gain of last year should at least be repeated during 1972. The company has undergone considerable reorganization, with more emphasis on marketing, but it remains to be seen whether or not this will result in DEC's coming out with products that will put it into the general-purpose business. Financing a rental base will definitely be a problem if it moves boldly in this direction.

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TABLE III

DEDICATED APPLICATION COMPUTER MARKET (GROUP B)
(U.S.-BASED MANUFACTURERS)

	Number Systems Shipped	Cumulative Number In Use	$ Million Value Shipped	Cumulative $ Million Value In Use
		WORLDWIDE		
1966	1,500	5,200	$ 110	$ 660
1967	2,750	7,900	175	825
1968	4,500	12,400	240	1,050
1969	8,100	20,300	357	1,380
1970	11,200	30,800	377	1,750
1971	11,600	41,700	$ 315	$ 2,055
1972	17,000	56,800	465	2,460
1973	21,100	76,000	540	2,910
1974	25,000	96,500	630	3,400
1975	30,700	123,000	740	4,000
1976	36,500	152,500	860	4,600
		UNITED STATES		
1966	1,000	4,000	$ 75	$ 565
1967	2,000	6,000	125	690
1968	3,500	9,500	180	865
1969	6,700	16,100	277	1,135
1970	9,500	25,000	307	1,425
1971	9,000	33,500	$ 249	$ 1,665
1972	14,000	46,500	377	1,990
1973	16,800	63,000	430	2,350
1974	19,500	80,000	490	2,750
1975	24,000	102,000	570	3,200
1976	28,000	126,000	660	3,650
		INTERNATIONAL		
1966	500	1,200	$ 35	$ 95
1967	750	1,950	50	135
1968	1,000	2,900	60	185
1969	1,400	4,200	80	245
1970	1,700	5,800	70	325
1971	2,600	8,200	66	390
1972	3,000	10,300	88	470
1973	4,300	13,000	110	560
1974	5,500	16,500	140	650
1975	6,700	21,000	170	800
1976	8,500	26,500	200	950

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Xerox continues to lose money on its computer operation, and had another decrease in shipments during 1971. But it has about as much staying power as it choses to exert. With the company's recent reorganization and purchase of little Diablo -- with its ingenious new terminal printer mechanism -- a line of computer terminals might be expected in the not-too-distant future.

HARDWARE SETS THE PACE FOR 19% INDUSTRY REVENUE GROWTH IN 1972

Each of the industry sectors shown in Table IV (page 10) are subjects of specialized study at IDC. And as timing is appropriate, most if not all of them will be the subject of EDP/IR features during the coming year. Each of these industry segments are -- or one day could be -- billion-dollar industries in their own right, and therefore worthy of special study. But to help the reader better understand the accompanying numbers, we present here a brief overview of these key computer industry sectors. As will be noted, many of the sectors are composed of portions that act quite differently -- some lagging and some leading.

Dedicated-application computer shipments were down in 1971 because the product mix is shifting toward pure minicomputers. The IBM 1800s, CDC 1700s, and XDS Sigma 2s and 3s are virtually gone from the new production totals. They accounted for less than 10% of the 1971 shipments (by value).

Despite all the new minicomputer manufacturers, this market is still dominated by Digital Equipment, which had almost 35% of the 1971 shipments, and Honeywell, with over 17%. Among the purely mini manufacturers, Hewlett-Packard was the leader -- with about 10% of shipments by value -- followed by Varian, Data General, General Automation, Interdata, Computer Automation, and a host of others. On a numbers basis, Data General was second only to DEC.

This sector is a nebulous one -- one that we have termed a "non-market" -- and as such is undergoing much change. For the OEM market, there is a trend toward smaller and smaller computers, even sophisticated logic boxes such as the PDP-16 -- not even a computer -- from DEC. At the same time, other companies are concentrating on end-user business, the most popular type at present being the single customer who needs a large number of machines for the same purpose. On the other hand, the single customer who needs a single machine is sort of a rare bird these days, and may have accounted for 10% to 15% of 1971 shipments.

Shipments of dedicated application computers -- mostly minis -- will be up over 50% in the U.S. this year as System/7 deliveries start in volume, capital spending increases, and new Federal funds are provided for education and medical services. New applications -- such as automobile inspection -- should continue to provide a good demand for minicomputers; the five-year increase expected for dedicated application computer shipments is over 22% on a dollar basis. And despite the ads, the average price of a minicomputer will not continue to plummet. Peripherals continue to be expensive, and EDP/IR sees the average price of a minicomputer falling from around the $27,000 level today down to only $23,000 or so for the average system shipped in 1976.

Independent peripheral equipment is broken down by IDC into two separate segments -- IBM plug compatible (including terminals) and off-line. Both sectors grew well during 1971; neither will show much shipment growth in 1972 although some further subsegments -- such as terminals -- will be among the most rapidly growing portions of the industry. This equipment must really be looked at on a product-by-product basis if its activity is to be understood.

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TABLE IV -- TOTAL WORLDWIDE REVENUE
ESTIMATED & PROJECTED REVENUE TO AMERICAN-BASED COMPANIES FROM KEY SECTORS OF THE EDP INDUSTRY
($ Millions)

	General Purpose Computers	Dedicated Application Computers+	Independent Peripheral Equipment*	Data Processing Supplies=	Batch and On-Line Services	Contract & Packaged Software	Total
1961	845	20	110	485	180		1,640
1962	1,210	35	130	530	220		2,125
1963	1,760	60	145	595	265	5	2,830
1964	2,250	75	170	630	295	20	3,440
1965	2,700	90	175	660	355	50	4,030
1966	3,735	110	185	725	425	100	5,280
1967	4,895	175	225	805	530	175	6,805
1968	6,910	240	315	895	715	270	9,345
1969	7,145	355	405	995	940	355	10,195
1970	7,645	375	605	1,020	1,265	440	11,350
1971	8,410	315	785	1,075	1,495	450	12,530
1972	10,240	465	825	1,180	1,825	405	14,940
1973	12,100	540	970	1,280	2,230	480	17,600
1974	14,130	620	1,130	1,380	2,695	560	20,515
1975	16,210	740	1,300	1,490	3,230	650	23,620
1976	18,460	860	1,500	1,610	3,860	750	27,040
1972-1976 Growth	2.2	2.7	1.9	1.5	2.6	1.7	2.16

+ In the past, virtually all Dedicated Application (Group B, page 14) computers were purchased by the user. In 1972, IBM begins volume shipments of its System/7, offered on a rental basis. But until user acquisition patterns are established, EDP/IR has elected to count Group B shipments as revenue.

* Some independent peripheral equipment is rented by the manufacturer, but most is supplied at OEM prices to other manufacturers or third-party leasing companies for renting. Thus, shipments are counted as revenues.

= Some disk packs were rented in the past, but will be sold in the future. Thus shipments -- which were only a small percentage of the total supplies market -- were counted as revenues during the 1967-1971 period.

Briefly, plug-compatible products -- primarily the tape and disk drives made by Telex, Memorex, Potter, Ampex, Marshall, Calcomp, Storage Technology, and others -- are equivalent to those made by IBM but offered at a lower price. They caught on quite well as the recession worsened and users realized they could save money without sacrificing computer capability. Of late, however, two moves by IBM have hurt the independents:

1) The fixed-term lease plan and purchase discount made IBM more price competitive and less vulnerable, since many users opted for two-year lease contracts that won't expire for another year and a half.

2) The start-up of volume System/370 deliveries -- with IBM's advanced 3330 disk drive and 3420 tape system plus built-in controllers on some of the models -- has dampened demand for older type products. The stop-gap double-density disk drive hasn't really caught on, but independents will soon be delivering IBM equivalents again.

Because of the shifting product mix and long lead time now necessary to unhook many IBM customers, EDP/IR sees shipments of plug-compatible auxiliary memory products holding level -- at the $250 million level -- this year. In some ways, however, this may be a blessing in disguise for the independents. Most of them were forced to offer their equipment on a rental basis, and a year of level shipment activity will help revenues catch up with prior capital outlays.

In the off-line segment of the independent peripheral market, the biggest dollars come from various key-entry systems -- key-to-tape, shared processors (key-to-disk), and buffered keypunches. The demand for most of these is peaking, so shipments of this type equipment will be up only some 8% to $450 million this year. On-line key entry -- through intelligent/CRT terminals -- will be catching on as IBM sets the pace. Its current effect on the total numbers is small, however, and terminal growth (EDP/IR Jan.17,1972) is hidden in the other numbers.

Supplies revenues climbed slowly in 1971, damped by a decreasing use of magnetic tape, and less paper use because of lower levels of business operations. Purchases of tape reels will be off again this year, but 3336 disk pack purchases will increase substantially. So, with cards and paper returning to their 8% annual growth rate, the total supplies market should be up almost 10% in 1972.

Services is the real computer industry growth area of the 1970s, and will be the subject of a special issue soon. Revenues were up "only" 18% in 1971, and this year should resume the steady 22% to 23% growth rate forecast for the next five years. Within this category are two subsectors: The batch service area itself is growing at a comfortable 13% to 14%; the on-line service area -- items such as timesharing, remote-batch service, and the like -- will clip along at a 35% growth rate over the next five years.

Software revenues in Table IV show erratic growth patterns because they include both packaged products -- taking off quite well but from a low base -- and custom software -- in a decline caused by tight budgets. Over the next five years, packaged software will grow at about 25% from a $100 million level in 1971, with IBM probably capturing only 30% to 40% of the total. The custom side will have a slower growth rate, but will continue to contribute more dollars to the software revenue column than packages -- at least during the five years under study. The future of this market is somewhat in question, because there are indications that many future software functions will be handled by hardware.

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GENERAL PURPOSE COMPUTER CENSUS

Counts in the General Purpose Digital Computer (Group A) Census, shown below, are based on the best information available to the International Data Corporation, but are estimates. Computer manufacturers, as a rule, do not directly supply this type of information, and it is only through the use of IDC's extensive data files and other information sources that such estimates are possible. The computers included in Group A comprise the bulk of digital computers (by value) in operation. They are byte or character oriented -- with the exception of large-scale scientific machines -- and are primarily programmed with higher-level languages. In addition to this Census, EDP/IR publishes a Dedicated Application Digital Computer (Group B) Census that includes minicomputers and specialized-purpose machines (page 14).

AS OF JANUARY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Burroughs	205	$ 4,600	1/54	1	6	7	X
	220	$ 14,000	1/58	3	2	5	X
	B-100 Series	$ 3,300	8/64	8	0	8	X
	B-200 Series	$ 6,500	11/61	218	138	356	X
	B-300 Series	$ 8,000	7/65	520	100	620	X
	B-500	$ 4,000	11/68	520	475	995	160
	B-2500	$ 6,800	2/67	270	123	393	40
	B-3500	$ 15,500	5/67	530	300	830	90
	B-4500	$ 29,000	11/71	4	0	4	50
	B-4700	$ 33,000	10/71	2	0	2	33
	B-5500	$ 35,000	3/63	137	43	180	X
	B-5700	$ 28,500	12/70	8	2	10	10
	B-65/6700	$ 68,000	11/69	32	30	62	20
	B-7700	$120,000	2/72	-	-	-	6
	Subtotals			2253	1219	3472	409
Control Data Corp.	G-20	$ 19,600	4/61	5	8	13	X
	1604/A/B	$ 42,000	1/60	23	4	27	X
	31/3150	$ 11,000	12/64	76	40	116	X
	3170	$ 17,500	12/70	23	9	32	6
	3200	$ 14,700	5/64	49	37	86	X
	3300	$ 21,500	9/65	110	97	207	15
	3400	$ 23,700	11/64	4	9	13	X
	3500	$ 26,000	1/69	8	11	19	4
	3600	$ 48,000	6/63	20	19	39	X
	3800	$ 53,000	12/65	15	5	20	X
	6200	$ 39,000	11/70	2	2	4	]
	Cyber-72	$ 32,900	10/71	1	0	1	] 6
	6400	$ 52,000	5/66	58	39	97	]
	Cyber-73	$ 45,000	3/72	-	-	-	] 9
	6500	$ 68,000	12/67	15	5	20	2
	6600	$115,000	8/64	61	36	97	X
	Cyber-74	$105,000	3/72	-	-	-	7
	6700	$125,000	7/70	4	1	5	0
	7600	$165,000	1/69	13	1	14	]
	Cyber-76	$165,000	3/72	-	-	-	] 4
	Star-100	$260,000	1/72	-	-	-	2
	Subtotals			487	323	810	55
Digital Equipment Corp.	PDP-6	$ 10,000	10/64	16	9	25	X
	1040/1050	$ 13,300	10/67-12/71	142	58	200	]
	1055	$ 25,000	12/71	3	0	3	]22
	1070/1077	$ 34,600	6/72- 9/72	-	-	-	5
Friden	System 10	$ 2,500	10/70	200	60	260	490
Honeywell Information Systems	Gamma 10	$ 1,950	7/64	0	1,170	1,170	X
	G-5X Series	$ 1,400	1/66	112	1,805	1,917	150
	G-105	$ 1,350	3/69	58	90	148	25
	G-115	$ 2,500	4/66	262	1,210	1,472	115
	G-120	$ 4,500	1/70	25	210	235	50
	G-130	$ 4,400	10/69	3	90	93	20
	G-205/215	$ 4,500	9/63- 6/64	18	0	18	X
	G-210	$ 16,000	3/60	18	0	18	X
	G-225/255	$ 13,000	4/61-10/67	156	22	178	X
	G-235/265	$ 17,000	4/64-10/65	72	30	102	X
	G-245/275	$ 18,000	2/68-11/69	5	4	9	2
	G-405/410	$ 9,000	2/68-11/69	36	11	47	7
	G-415/420	$ 14,000	5/64- 6/67	198	261	459	X
	G-425/430	$ 17,000	6/64- 6/69	81	100	181	X
	G-435/440	$ 22,000	9/65- 7/69	47	38	85	6
	615	$ 55,000	6/69	21	19	40	X
	625	$ 65,000	4/65	1	4	5	X
	635	$ 80,000	5/65	65	15	80	X
	645	$120,000	7/66	3	0	3	X
	6030/6040	$ 25,000	6/71- 3/72	7	5	12	45
	6050/6060	$ 46,500	7/71- 3/72	5	3	8	28
	6070/6080	$ 61,500	7/71- 3/72	2	2	4	17
	G-Subtotal			1,195	5,089	6,284	465
	H-105	$ 2,100	11/71	20	3	23	NA
	H-110	$ 3,200	9/68	195	205	400	55
	H-115	$ 4,100	3/70	330	120	450	150
	H-115/2	$ 6,600	1/71	300	25	325	160
	H-120	$ 5,000	1/66	760	320	1,080	X
	H-125	$ 7,400	12/67	150	350	500	65
	H-200	$ 7,600	3/64	740	345	1,085	X
	H-1015	$ 11,800	4/71	55	23	78	65
	H-12/1250	$ 12,500	2/66- 8/68	425	193	618	X
	H-2015	$ 12,800	2/71	80	15	95	60
	H-2200	$ 19,600	1/66	130	69	199	X
	H-3200	$ 24,000	2/70	48	23	71	20
	H-4200	$ 31,000	9/68	26	6	32	6
	H-8200	$ 73,000	2/69	18	3	21	5
	H-4/1400	$ 13,200	12/61- 1/64	42	37	79	X
	H-800	$ 28,500	12/60	55	13	68	X
	H-1800	$ 46,000	7/64	12	3	15	X
	H-Subtotal			3,386	1,753	5,139	586
	HIS-Subtotal			4,581	6,842	11,423	1,051

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AS OF JANUARY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
IBM	System-3/6	$ 1,140	12/70	1,620	330	1,950	]
	-3/10	$ 1,600	1/70	3,500	770	4,270	]4200
	360/20	$ 4,200	12/65	8,400	5,950	14,350	X
	360/22	$ 5,600	7/71	360	25	385	550
	360/25	$ 8,000	10/68	2,380	1,270	3,650	200
	360/30	$ 12,300	6/65	6,000	3,100	9,100	X
	370/135	$ 16,200	5/72	-	-	-	2400
	360/40	$ 22,000	5/65	3,150	2,100	5,250	X
	370/145	$ 28,900	7/71	450	175	625	1600
	360/44	$ 13,800	7/66	100	103	203	X
	360/50	$ 36,500	8/65	1,225	695	1,920	X
	370/155	$ 50,900	2/71	490	170	660	780
	360/65	$ 69,000	11/65	610	250	860	X
	370/165	$ 89,000	6/71	88	26	114	255
	360/67	$138,000	6/66	66	11	77	X
	360/75	$ 91,000	1/66	53	25	78	X
	360/85	$155,000	10/69	22	9	31	X
	360/9X	$150,000	11/67	15	3	18	X
	360/195	$210,000	3/71	4	1	5	5
	370/195	$215,000	5/73	-	-	-	3
	1130	$ 2,200	2/66	4,090	2,100	6,190	150
	305	$ 3,600	12/57	1	22	23	X
	650	$ 4,800	12/54	4	34	38	X
	1401	$ 6,200	9/60	1,620	1,790	3,410	X
	1401-G	$ 2,300	5/64	270	108	378	X
	1401-H	$ 1,300	6/67	150	36	186	X
	1410	$ 17,000	11/61	147	91	238	X
	1440	$ 4,100	4/63	660	580	1,240	X
	1460	$ 9,800	10/63	87	54	141	X
	1620	$ 4,000	9/60	430	280	710	X
	7010	$ 26,000	10/63	22	13	35	X
	7030	$160,000	5/61	3	1	4	X
	704	$ 32,000	12/55	2	3	5	X
	7040	$ 25,000	6/63	20	23	43	X
	7044	$ 36,500	6/63	16	18	34	X
	705	$ 38,000	1/56	10	5	15	X
	7070/74	$ 27,000	3/60- 2/61	138	46	184	X
	7080	$ 60,000	8/61	54	1	55	X
	7090	$ 63,500	8/60	23	19	42	X
	7094	$ 73,400	9/62	66	9	75	X
	7094-II	$ 79,400	4/64	16	0	16	X
	Subtotals			36,362	20,246	56,608	10,143
NCR	Century-50	$ 1,650	2/71	190	10	200	135
	Century-100	$ 2,600	9/68	1,500	525	2,025	170
	Century-200	$ 7,700	9/69	460	215	675	120
	Century-300	$ 20,000	2/72	-	-	-	20
	304	$ 10,000	1/60	12	2	14	X
	310	$ 1,000	5/61	10	3	13	X
	315	$ 7,000	5/62	340	370	710	X
	315-RMC	$ 9,000	9/65	125	50	175	X
	390	$ 800	5/61	250	375	625	X
	500	$ 1,000	10/65	950	1,700	2,650	X
	Subtotals			3,837	3,250	7,087	445
Philco	1000	$ 7,000	6/63	23	1	24	X
	210/211	$ 40,000	10/58	12	1	13	X
	212	$ 52,000	1/63	11	1	12	X
RCA	2	$ 14,600	7/71	40	0	40	40
	3	$ 19,600	10/71	10	0	10	6
	6	$ 29,900	10/71	3	0	3	8
	7	$ 40,100	10/71	5	0	5	12
	Spectra 70/15	$ 5,100	9/65	23	0	23	X
	Spectra 70/25	$ 7,900	9/65	3	3	6	X
	Spectra 70/35	$ 13,600	1/67	150	6	156	X
	Spectra 70/45	$ 23,100	11/65	350	27	377	X
	Spectra 70/46	$ 40,200	11/68	50	4	54	10
	Spectra 70/55	$ 41,600	11/66	17	2	19	X
	Spectra 70/60	$ 43,100	9/70	14	0	14	5
	Spectra 70/61	$ 55,000	3/71	10	0	10	14
	301	$ 9,500	10/60	223	17	240	X
	3301	$ 25,000	7/64	72	0	72	X
	501	$ 17,000	6/59	29	2	31	X
	601	$ 50,000	11/62	4	0	4	X
	1600	$ 2,700	1/69	49	0	49	X
	Subtotals			1052	61	1113	95
Standard Computer Corp.	IC-4000	$ 9,000	9/68	10	0	10	X
	IC-6000	$ 16,000	5/67	9	0	9	X
	IC-7000	$ 17,000	6/69	18	0	18	X
Univac	I/II	$ 25,000	3/51-11/57	3	2	5	X
	III	$ 25,400	8/62	44	45	89	X
	SS-80/90	$ 8,000	8/58	53	67	120	X
	418-I/II	$ 13,700	6/63- 9/64	85	81	166	X
	418-III	$ 19,600	7/69	35	50	85	10
	491/492	$ 27,000	12/61	18	14	32	X
	494	$ 41,400	2/66	54	41	95	X
	1004	$ 1,900	2/63	1100	1260	2360	X
	1005	$ 2,550	4/66	840	190	1030	X
	1050	$ 8,800	9/63	195	180	375	X
	1103/1105	$ 35,000	12/50- 9/58	3	2	5	X
	1106	$ 40,000	12/69	36	50	86	30
	1107	$ 57,000	10/62	14	16	30	X
	1108	$ 68,000	9/65	148	82	230	X
	1110	$ 79,000	5/72	0	0	0	8
	9200	$ 1,700	6/67	1500	740	2240	125
	9300	$ 4,000	9/67	810	880	1690	150
	9400	$ 10,000	5/69	185	174	359	70
	9700	$ 21,000	8/72	-	-	-	10
	Larc	$135,000	5/60	1	0	1	X
	Subtotals			5124	3874	8998	403
XDS	Sigma-5	$ 11,500	8/67	130	33	163	16
	Sigma-6	$ 20,000	11/70	13	3	16	7
	Sigma-7	$ 24,000	12/66	85	22	107	5
	Sigma-8	$ 19,000	9/71	3	0	3	8
	Sigma-9	$ 44,000	11/71	2	2	4	6
	940	$ 24,000	4/66	69	3	72	X
	9300	$ 8,500	11/64	26	6	32	X
	Subtotals			328	69	397	42
	TOTALS			54,468	36,014	90,482	13,160

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AS OF JANUARY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	NOTES	BITS PER WORD	PRICE CLASS	PURCHASE PRICE ($1,000) BASIC	PURCHASE PRICE ($1,000) AVERAGE	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Interdata	1		8	1	4	11	11/70	150	50	200	50
	2		8	1	9	11	7/68	20	0	20	X
	3		16	1	13	20	5/67	200	20	220	X
	4		16	1	9	17	8/68	260	115	375	40
	5		16	1	11	25	11/70	70	20	90	10
	15		16	2	22	35	1/69	40	24	64	X
	50		16	1	7		1/72	-	-	-	NA
	55		16	1	16		1/72	-	-	-	NA
	70		16	1	7		8/71	NA	NA	NA	60 +
	80		16	2	16		5/72	-	-	-	NA
	Subtotals							740	229	969	160 +
Interplex	System-1		16	2	47	47	9/70	NA	0	NA	NA
Lockheed Electronics	MAC-16		16	1	11	22	3/69	295	30	325	]
	MAC-Jr.		16	1	8	16	11/70	195	20	215	] 150
	Sue		16	1	4	8	2/72	-	-	-	NA
Microdata Corp.	400		8	1	3	4	1/72	-	-	-	NA
	800		9	1	3	8	1/69	154	41	195	NA
	810		8	1	6	10	5/69	310	10	320	NA
	812		8	1	11	15	12/69	32	0	32	NA
	820			1	6	13	10/70	28	0	28	NA
	1600		16	1	5	11	2/72	-	-	-	NA
Mini Comp.	MD-708		8	1	5	7	8/70	25 +	0	25 +	NA
	Administrator-2		16	3	35	52	12/70	NA	0	NA	NA
	Multi User-E		16	3	67	85	11/70	NA	0	NA	NA
	Multi User-I		16	3	40	58	1/71	NA	0	NA	NA
Modular Computer Systems	Modcomp-I		16	1	5		11/71	NA	0	NA	NA
	Modcomp-II		16	2	10	27	7/71	NA	0	NA	] 300
	Modcomp-III		16	3	14	65	12/70	NA	0	NA	]
Motorola Comm. Div.	MDP-1000		8	1	8	19	2/69	50 +	0	50 +	NA
Nuclear Data, Inc.	ND-812		12/24	1	7	10	1/71	NA	0	NA	NA
Omnicomp Computer Corp.	Omnus-1		16	1	5	12	4/71	NA	0	NA	NA
Qantel Corp.	Quantel-V		8	2	14	26	4/70	70 +	0	70 +	NA
Raytheon Computer	703		16	1	13	23	10/67	171	31	202	X
	704		16	1	10	18	4/70	100	35	135	50
	706		18	2	19	30	5/69	60	14	74	X
	PB-250		22	2	33	48	12/60	155	20	175	X
	PB-440		24	4		140	3/64	18	2	20	X
	PB-520		24	4		128	10/65	26	1	27	X
Redcor Corp.	RC-70		18	2	15	30	7/68	125	15	140	X
Rolm Corp.	1601	h	16	2	20	28	3/70	40	5	45 +	NA
Sanders	Series 800		16				12/71	-	-	-	NA
Scientific Control Corp.	600 Series		24	3	31	80	10/65	230	0	230	X
	4700		16	3	15	50	4/69	23	0	23	NA
	DCT-132		8	2	28	30	5/69	51	19	70	NA
Spear	Microlinc		12	3	46	57	6/66	33	3	36	X
Spiras Systems/USM	65		16	2	19	40	8/69	25	0	25	NA
Sys. Computer Corp.	1000				4		1/72	93	0	93	NA
	1500										NA
Systems Eng. Labs.	810		16	2	38	45	9/65	24	0	24	X
	810-A		16	3	18	90	4/67	236	10	246	X
	810-B		18	4	30	150	12/68	95	5	100	X
	840		24	3	65	80	11/65	3	0	3	X
	840-A		24	3	60	75	8/66	36	2	38	X
	840-MP		26	4	49	250	12/67	33	0	33	X
	72		16	2	19	40	9/70	7	0	7	NA
	85		32	4	150	240	7/72	-	-	-	NA
	86		32	4	200	325	6/70	14	0	14	NA
	88		32	4	350	600	3/71	1	0	1	NA
Tempo Computers/GTE	1		16	1	14	22	12/69	50	0	50	NA
Texas Instruments	960		18	2	14	30	6/70	20 +	0	20 +	NA
	960-A		16	1	3						
	980	i	17	2	17	40	5/68	100 +	0	100 +	NA
Unicom, Inc.	CP-8A		8	1	3		2/70	32 +	2	34 +	40 +
	CP-8B		8	1	3		3/70	20 +	0	20 +	32 +
	CP-8C		8	1	5		3/70	30 +	4	34 +	61 +
	CP-8D		8	1	7		4/70	9 +	0	9 +	3 +
Unicomp, Inc.	Comp-16		16	2	11	27	6/70	14 +	0	14 +	7 +
	Comp-18		18	2	12	38	8/70	20 +	0	20 +	12 +
Varian	520/i		9	1	6	13	9/68	300	140	440	340
	610		12	1		15	7/64	10	0	10	X
	620		16	2		37	11/65	75	0	75	X
	620/i		18	1	10	20	9/67	1600	85	1685	NA
	620/f		16	1	11	25	11/70	150	25	175	100 +
	620/1		16	1	5	12	6/71	40	10	50	NA
	R 620/i		18	2	14	28	7/68	28	2	30	X
	R 622/i		18	2	15	30	7/68	90	10	100	NA
	Subtotals							2293	272	2565	440 +
Varisystems	PAC-16	j	16	1	4		9/69	20 +	0	20 +	NA
Wang Labs, Inc.	3300		8	2	14	40	8/71	NA	NA	NA	45 +
Weismantel Assoc.	WAICO M-16		16	4	90	120	11/70	NA	NA	NA	NA
Westinghouse Elec. Corp.	P-50		14	1	16	23	8/64	203	19	222	X
	P-250	k	16	3	40	62	9/67	58	10	68	X
	P-510		18	4	85	110	6/63	21	2	23	X
	P-550		18	4	85	110	6/63	9	4	13	X
	P-580		18	4	85	110	6/63	9	0	9	X
	P-2000		16	2	10	27	8/69	120	27	147	25
	2500		16	2	10	30	11/71	6	0	6	75
	Subtotals							426	62	488	100
Xerox Data Systems	92		12	3		90	4/65	42	8	50	X
	910		24	4		120	8/62	168	15	183	X
	920		24	4		150	9/62	111	19	130	X
	925		24	4		200	12/64	13	2	15	X
	930		24	4	80	400	6/64	112	18	130	X
	CE-16		16	1	8	13	5/69	17	0	17	NA
	CE-16/A		16	1	15	25	12/69	50	0	50	NA
	CF-16/A	l	16	1	8	17	11/70	25	0	25	NA
	Sigma-2		16	4	24	125	12/66	210	40	250	X
	Sigma-3		17	4	24	140	1/70	140	40	180	NA
	Subtotals							888	142	1030	NA
	TOTALS							33,523	8,205	41,728	

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" April 11,1972 • VOL.7,NO.11 P.J.McGOVERN,EDITOR

Add-on core settlement -- Page 4

IBM SWINGS OUT AT COMPETITION WITH 370 IMITATOR OF SECOND-GENERATION EQUIPMENT; HONEYWELL, RCA, AND ICL COMPUTER MODELS SINGLED OUT FOR ATTACK

> *To protect [its] investment, and give itself more flexibility . . . IBM has taken the hardware-in-software approach . . . Looking into the future, we forsee [this] allowing IBM to design a new machine function, load it into a new floppy disk for the customer, and pop it into the mail. This approach gives IBM account control, flexibility, and protection; it also makes things a little tougher for manufacturers of competitive equipment.*
>
> -- EDP/IR March 24, 1971

It had to happen!

Almost from the day IBM introduced the 370/145 and its Reloadable Control Storage (talked about by IBMers even upon announcement as the "floppy disk"), there was no technical reason why competitive computers couldn't be imitated by System/370. IBM 1400 series and smaller 7000 series computers were "available" this way at the time of the original announcement.

Some observers thought IBM would shun this approach for antitrust reasons. But a new spirit of marketplace aggressiveness seems to have taken hold, and IBM has made available -- for first quarter 1973 delivery -- competitive emulators, or imitators, for the 370/135 and 370/145. The machines that can be mimicked are the RCA 301, the Honeywell Series 200, and ICL's 1900 Series.

The microcode emulator works essentially the same way as those for IBM's 1400 series equipment, the company says. So it is no wonder that the computers singled out for attack are those that were directly competitive with IBM second-generation equipment during the mid-1960s. IBM pooh-poohs this rationale, but it makes sense to EDP/IR. What better customer to go after than one who originally was yours and now has equipment more or less compatible with your old line?

The emulators made available to date (they weren't officially announced by IBM, and technically are "RPQ" or special items) operate on the smaller 370s only under DOS (Disk Operating System); they "would have to be significantly altered" to operate under OS, IBM says. The RCA version costs $675 per month; the one for Honeywell's Series 200 is slightly less, at $625 per month. Running on the 370,

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the program requires space for itself, plus "emulated storage" equivalent to that provided by the older machine. For one Honeywell configuration, IBM explains, this means 21K bytes for console, card I/O, printer, and six tape units plus the 2 to 256K bytes of emulated memory.

Sharing retirement problems?

That's the WHAT from IBM. The WHY is more subtle, especially if we analyze more deeply than the fact that IBM is out to get all the business it can. It looks as if IBM might be saying:

> *Look, we've suffered long enough from the fact that the 370 is so good; we've had enough of those sidegrades where customers throw out a 360/30 and a 40 for a 370/145 and save several thousand dollars in the process. Why not get the customer to upgrade one of our computers and throw out one of somebody else's and pay us to replace it -- with our neat little floppy disk trick? The customer still saves money -- that's what this marketing round is all about. But IBM gets more of the dollars he is spending. That's what IBM is all about.*

Fiction? The words, surely; the thought . . . never! IBM was stuck with more than its share of 1971's $2.4 billion worth of retirements of general-purpose computers made by U.S.-based manufacturers (EDP/IR Mar.30,1972); so it will certainly be doing everything it can to shift some of the burden to other companies . . . even to ICL and Siemens (with its RCA 301s).

In the case of the second-generation RCA equipment, the picture is reasonably clear. About two-thirds of the 301s are customer owned and therefore were not part of the transfer when RCA sold its customer base to Univac at the start of 1972. These customers certainly feel left out in the cold. Furthermore, a good many Spectra/70s emulate 301s just as 360s still emulate 1401s. Finally, many RCA computers operate alongside IBM equipment and are very likely candidates for the "shrinkage" upgrade suggested above. Thus, enter IBM suggesting an upgrade to 370 with the "replacement" of a $9,500-a-month computer with a simple $675-a-month emulator.

The situation with Honeywell is less clear -- or more straightforward, depending on your point of view. Honeywell and IBM computers aren't heavily concentrated in the same computer rooms, and HIS certainly hasn't given its customers any reason to doubt its long-term staying power. Indeed, Honeywell is stressing its newest product offerings when the emulator situation arises. One of its support bulletins for field salesmen says:

> The counter to this latest move by IBM is to notice that the emulation capability is only available under DOS. Is the Model 135 user going to be satisfied with DOS? . . . We think not. We suggest you review the superiorities of OS/2000 over DOS. Rather than a customer moving over to Series 200 emulation under DOS, show him how he can more easily move to Series 2000, and reap the benefits of a superior operating system and better price/performance.

This is all well and good. But Honeywell forgets the pinch IBM is in . . . the retirement problems its new technology and better price/performance are causing. Also, perhaps IBM doesn't forget how Honeywell got its start in the computer industry. All those 1401s it "liberated" back in the middle 1960s.

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A microcosmic preview?

At least for the next few years, competitive switching could be very important in the computer marketing game. First-time computer users are contributing not only a declining percentage of shipments each year; they actually are expected to account for a smaller number of shipment dollars each year. And the big surge in equipment for vast networks -- for distributed computing as we describe it -- is probably still a few years away.

In the interim, competitive marketing will be as important as customer upgrade. So IBM's introduction of software competitive emulators could be the forerunner -- a preview in microcosm -- of many marketing duels to come. This is one of the upgrade techniques available.

The CDC/NCR Swing processor (EDP/IR Feb.8,1972) will be based on microcode emulation, as almost certainly will be any new HIS product line that takes care of both Honeywell and GE customers. And IBM's microcode emulator -- actually a software package -- certainly works better than previous hardware emulators on System/360 for several competitive machines as well as IBM second-generation equipment. So it will be interesting to watch this preview before other companies introduce microcode . . . while the shoe is on the other foot.

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MEMOREX ENTERS "TOTAL DATA PROCESSING SYSTEM MARKETPLACE"

With two computer systems priced to rent from $2,500 to $12,000 per month -- the range covered by IBM's 360/20, 25, and 30 . . . the range where a 370/125 would fit -- Memorex says it has entered the mainframe marketplace. The MRX/40 and 50, the "first two models of what will be a family of compatible Memorex computers," are designed "to fill a widespread need in the data processing industry for a general purpose computer with large data base capacity, superior communications capabilities, and the potential for expansion."

Everything about the computers, in fact, make it sound as if Memorex is trying to pre-announce IBM's expected 370/125:

- "Compatibility with the 360/20 is available to facilitate conversion;
- "Systems give great emphasis to the use of large disc storage capacity and comprehensive telecommunications capability;
- "The MRX/40 and 50 are designed to meet the remote processor requirements of large divisionalized corporations as well as the user of small commercial systems."

"Commitment to the computer systems business"

With the announcement, Laurence L. Spitters, Memorex president, said: "In the three-year time span, from the first customer shipment of a peripheral equipment to an end user in early 1970, to the first customer shipment of a Memorex system scheduled for late 1972, Memorex will have spent $100 million, apart from our investment in the manufacturing costs of our existing lease base.

"This spending for product development, marketing activities, and facilities is undoubtedly the highest by any new entrant to the computer systems business

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during the past decade. This spending is testimony to our commitment to the computer systems business and our determination to be in its front rank.

"To be successful in the systems business, a company must be committed to that business. Commitment is critical because the data processing industry is characterized by growth and change resulting from the economics of technological advancements and requiring large infusions of capital and people. We at Memorex have grown up in this industry and our commitment is total."

Memorex says it has peripheral equipment installed at more than 2500 IBM installations across the country, that the company has surveyed these and other users, and that "we've been told that there is a need for a computer of the size and type of the MRX/40 and 50." The company also says the survey shows that the users surveyed are willing to replace their present IBM equipment with computer systems from Memorex.

Some passing thoughts

Upon hearing words such as these, EDP/IR must recall the similar statements made by RCA and still fresh in our thinking. There's no question about the ability of Memorex to build the computers it has announced. There's no question that a significant number of customers are available. But there is a question about the company's ability to finance a large rental base. And there certainly is a question about how much erosion of its rental base IBM will put up with.

There are over 14,000 360/20s installed worldwide. Honeywell has made a concerted attack on this base and has several hundred H-115s to show for it. So if success of this sort will make Memorex think it is in the "front rank" of the computer business, the company may do all right. But if its goals are set vastly higher, there is a serious question as to how the lease base will be paid for, and how vigorously IBM will choose to compete.

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IN THE WAKE OF IBM-AMS/ITEL SETTLEMENT, ADD-ON MEMORY ACTIVITY CONTINUES

The legal flap over extending a 360's core memory above IBM's limits (EDP/IR Feb.22,1972) came to an end late in March with a stipulated final judgement between IBM and the complaintants, AMS and two Itel subsidiaries. In the wake of this, Telex has introduced a line of 370-compatible memories and other add-on memory suppliers are back in there swinging. As a result, the installed base of these products could double this year.

The settlement works well for both sides: It lets Itel (and other suppliers) continue extending 360 memories; it gets IBM off the maintenance hook for alterations, and prevents Itel from renewing the antitrust claims made against IBM in the complaint it filed. Here are the provisions IBM says are included in the stipulated final judgment:

> --Although, in IBM's judgment it is impractical to maintain an altered System/360, Model 30 CPU to which AMS or ITEL memories above 64,000 bytes have been attached, IBM will continue to attempt to service these CPUs on a best-efforts basis, using standard IBM diagnostics and maintenance documentation. If, as a result, IBM concludes that a failure is in a portion of the machine in which there are alterations or attachments, it may require the customer, at his option, to either remove or

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detach the alteration before IBM service can continue, or to call on the service organization responsible for maintaining the alteration.

--Customers who want this best-efforts service will be required to enter into contract amendments which will so limit IBM's obligation to provide service.

--IBM is not required to maintain AMS or Itel memories or any portion of attachments or alterations to CPUs.

--AMS and Itel will, if IBM maintenance is desired on the unaltered portion of an IBM machine, whenever reasonably possible, design future attachments of memories to IBM systems in a manner which facilitates service and maintenance. If asked, IBM will inspect these alterations and advise whether it believes maintenance of the unaltered portion to be practical, using standard IBM diagnostics and maintenance documentation.

IBM said that it expected to discuss its relationships with other memory manufacturers on an individual basis. To date, comments are in from only the two major suppliers. These two groups (comments, below), however, accounted for over three-fourths the add-on/replacement 360 memory (by value) installed at yearend 1971. Here's what they say:

Data Recall announced that it has "reached an understanding with IBM Corporation regarding the terms under which IBM will continue to maintain central processing units where the memory capacity has been expanded by Data Recall beyond the IBM standard. The parties are in the process of reducing their understanding to writing, and details will be furnished to customers when completed." Computer Investors Group, Inc., exclusive worldwide marketing organization for Data Recall memories, says that IBM has inspected 360/22, 30, 40, and 50 processors with Data Recall memories, and "they are acceptable to IBM for maintenance."

Advanced Memory Systems, which manufacturers add-on memory devices for Itel, says the settlement "is a significant decision since it assures the users of IBM computers the cost savings benefit of AMS' semiconductor main memory add-on, and further supports the fact that AMS' main memory add-ons are completely compatible to IBM equipment."

AMS also supplies semiconductor main memory for System/370, and it is marketed by Itel as well. It's hard to say, yet, how successful these replacements for newer IBM memory boxes will be. But another entrant has jumped into the race.

Telex this week announced two modular and expandable semiconductor memories for System/370 Models 145, 155, and 165. They are equivalent, the company says, to the IBM processor add-on storage modules and offer the user at least equal performance at a substantial cost savings.

The Telex 6345 and 6360 Processor Storage Systems offer offline maintenance capability in addition to error checking and correction functions which automatically correct all single-bit errors and detect all double-bit errors, just as the IBM systems do. The offline maintenance feature allows memory diagnostics without the use of the CPU. Thus, the sort of problems encountered with the 360 shouldn't come up with this Telex product.

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Even while the court fight over maintenance was in process (page 5) activity in supplying add-on memories didn't quit. Cambridge Memories, Inc. disclosed during March that it had been awarded two major contracts from the Army and Navy. The two separate contracts, signed within days of each other, were in excess of $2 million. The awards include the replacement of most of the IBM-supplied core memories on 38 System/360 computers -- including Models 30, 40, and 50 -- and the extension of the memories of 32 of the systems beyond the IBM-specified maximum memory limits. Shipments have already begun.

+ + + + +

IBM STEADILY BEEFS UP ITS SYSTEM/7 OFFERINGS

This should be the year of large volume System/7 shipments by IBM, and the company has quietly been adding features to this dedicated application computer. Only some 225 systems were shipped during the final months of 1972, according to EDP/IR, and many of these were stand-alone units. But thousands are expected to roll away from the Boca Raton shipping docks during 1972, more of them headed for large factory automation applications.

Improvements announced last year were a disk module and a custom console that lets users display process status or interact with the computer. New features and program products announced recently and summarized in the Spring issue of IBM's Computing Report (written for scientific and engineering customers) are:

- Controlled Access System, which limits access to a building or other facility. Entry can be controlled -- through card readers at entrance doors hooked directly to the computer -- by door, time of day, day of week, or security classification of authorized persons.

- Application Program Generator (APG/7), a program product which uses "fill-in-the-blanks" programming with a high-level procedural language to support sensor-based programming development for plant automation, process control, and data acquisition applications.

- System/370 Distributed System Program, which merges the power and programming support of a System/360 or System/370 host computer with the sensor-based capabilities and the rapid response of one or more System/7s.

- System/7 Fortran IV Host Compiler and Library, a program product which, running on a System/360 or System/370 host, translates Fortran statements into operational programs for System/7 applications.

The computer seems to be catching on quite well in Europe, according to reports from EDP Europa Report. With wages rising rapidly, manufacturing companies abroad are looking to more types of automation to keep costs in line. Apparently, System/7 is often the answer. Involvement in the factory process, of course, is what this computer is all about.

+ + + + +

ANNUAL COMPUTER STOCK SUMMARY

Stock market review of major companies in the computer industry appears on page 8 of this issue. This summary of stock price activity is comparable to one published last year (EDP/IR Mar.12,1971) and is provided for reader convenience.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

DATA RECALL CORP.

Data Recall Corp., 142 Oregon St., El Segundo, Calif. 90245, a company that manufacturers add-on memory for IBM System/360 computers, on March 28 filed for 400,000 shares of common, of which 300,000 are to be offered for public sale by the company and 100,000 (being outstanding) by the holders. Of the proceeds, at $15 per share max., $760,000 will be used to retire short-term bank indebtedness, and the balance for working capital. Underwriters are headed by Oppenheimer & Co., One New York Plaza, New York, N.Y. 10004.

STORAGE TECHNOLOGY CORPORATION

Storage Technology Corp., 2270 S. 88th St., Louisville, Colo. 80027, a manufacturer and marketer of computer peripheral equipment, filed on March 13 for 543,455 shares of common, of which 400,000 are to be offered for public sale by the company. Net from the proceeds, at $24 per share max., will be for bank borrowings, working capital, and general corporate purposes. Underwriters are headed by C.E. Unterberg, Towbin Co., 61 Broadway, New York, N.Y. 10006.

VARISYSTEMS CORPORATION

Varisystems Corporation, 80 Skyline Drive, Plainview, N.Y. 11803, which offers a small digital computer, interface circuitry, special programming, and related peripheral equipment, filed on Mar. 24 for 200,000 shares of common, of which an unspecified number are to be offered for public sale at $15 per share max. Proceeds will be used for product engineering and development and working capital. The underwriters are headed by First Equity Corp. of Fla., 100 W. Kennedy Blvd., Tampa, Fla. 33602.

UNITED COMPUTING SYSTEMS, INC.

United Computing Systems, Inc., 3130 Broadway, Kansas City, Mo. 64111, a company engaged in computer timesharing, on-site and remote-batch processing, and software services, filed on March 27 for 100,872 shares of common stock issuable pursuant to warrants, which the company proposes to issue to its shareholders (other than United Utilities, Inc., which will receive warrants to purchase 1,747,296 shares) or holders of options. The warrants are to be issued at the rate of warrants to purchase 6 shares of common for each share held.

WANG COMPUTER PRODUCTS, INCORPORATED

Wang Computer Products, Inc., 2300 Broadway, Santa Monica, Calif. 90404, a company in the low cost, medium performance digital magnetic tape drive business, filed on March 14 for 275,000 shares of common, to be offered at $8 max. Of the proceeds, $700,000 will be used to reduce the company's revolving line of bank credit and the balance for working capital. Underwriters are headed by Robertson, Colman & Siebel, 235 Montgomery St., San Francisco 94104.

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ANNUAL COMPUTER STOCK SUMMARY

	Last Twelve Months						Calendar 1971					
	71-72 High	71-72 Low	71-72 Close	Feb.25,1972 Close	One Year Net Change	One Year % Change	1971 High	1971 Low	1971 Close	Dec.31,1971 Close	1971 Net Change	1971 % Change
NEW YORK EXCHANGE												
Address-Mult.	49	24	39	30	+ 9	+ 30	49	24	34	27	+ 7	+ 26
American R&D	72	42	71	53	+ 18	+ 34	66	42	55	47	+ 8	+ 17
Ampex Corp.	25	7	10	19	- 9	- 47	25	11	14	18	- 4	- 22
Automatic DP	86	43	84	52	+ 32	+ 62	78	43	74	45	+ 29	+ 64
Bunker Ramo	17	6	10	12	- 2	- 17	17	6	8	16	- 8	- 50
Burroughs	173	105	170	108	+ 62	+ 57	160	105	153	109	+ 44	+ 40
Collins Radio	21	10	16	16	--	--	21	10	13	15	- 2	- 13
Computer Sciences	17	6	8	12	- 4	- 33	17	6	8	10	- 2	- 20
Comput. & Softw.	46	16	23	32	- 9	- 28	46	16	24	30	- 6	- 20
Control Data	85	32	60	58	+ 2	+ 5	85	32	46	51	- 5	- 10
DPF Inc.	19	8	11	14	- 3	- 21	19	8	10	12	- 2	- 17
Digital Equipment	92	53	90	67	+ 23	+ 34	86	53	77	57	+ 20	+ 35
Electronic Assoc.	9	5	9	7	+ 2	+ 28	9	5	6	5	+ 1	+ 20
Electronic Mem.	18	5	7	10	- 3	- 30	18	5	7	9	- 2	- 22
Honeywell	156	82	151	98	+ 53	+ 54	139	82	133	83	+ 50	+ 60
IBM	375	283	373	337	+ 36	+ 11	366	283	337	318	+ 19	+ 6
ITT	67	46	64	55	+ 9	+ 16	67	46	58	51	+ 7	+ 14
Leasco	27	16	21	19	+ 2	+ 15	27	16	21	16	+ 5	+ 31
Memorex	80	19	32	58	- 26	- 45	80	19	33	57	- 24	- 42
Mohawk Data Sci.	47	14	21	30	- 9	- 30	47	14	22	26	- 4	- 15
National Cash Reg.	49	24	32	39	- 7	- 18	49	24	29	39	- 10	- 26
RCA	43	26	41	31	+ 10	+ 32	41	26	37	27	+ 10	+ 37
Raytheon	46	27	45	35	+ 10	+ 31	46	27	40	28	+ 12	+ 43
SCM	23	13	18	17	+ 1	+ 6	23	13	18	14	+ 4	+ 29
Sanders	23	9	18	17	+ 1	+ 6	23	9	16	13	+ 3	+ 23
Sangamo	21	10	18	18	--	--	21	10	14	15	- 1	- 7
Singer	91	63	91	71	+ 20	+ 28	79	63	77	65	+ 12	+ 18
Sperry Rand	38	22	37	31	+ 6	+ 19	38	22	31	26	+ 5	+ 19
Teledyne	33	15	26	26	--	--	33	15	24	24	--	--
Telex	22	8	12	16	- 4	- 25	22	8	12	17	- 5	- 29
Univ'ty Comput.	39	13	20	24	- 4	- 13	39	13	20	22	- 2	- 9
Western Union	52	34	50	47	+ 3	+ 6	52	34	44	42	+ 2	+ 5
Xerox	135	85	135	96	+ 39	+ 40	127	85	125	87	+ 38	+ 44
AMERICAN EXCHANGE												
Applied Data Res.	14	4	6	12	- 6	- 50	14	4	5	5	--	--
CalComp	33	14	22	26	- 4	- 15	33	13	20	25	- 5	- 20
DPA, Inc.	9	4	7	6	+ 1	+ 16	9	4	8	4	+ 4	+ 1
Data Products	10	3	6	8	- 2	- 25	10	3	5	7	- 2	- 29
Greyhound Computer	11	7	10	9	+ 1	+ 11	11	7	8	7	+ 1	+ 14
ITEL	23	7	11	17	- 6	- 35	23	7	11	16	- 5	- 31
Milgo Elect.	30	11	29	18	+ 11	+ 61	26	11	17	25	- 8	- 32
Potter Instrument	25	11	18	21	- 3	- 14	25	11	16	17	- 1	- 6
Rockwood	9	3	6	6	--	--	9	3	4	5	- 1	- 20
System Eng. Labs.	18	7	12	14	- 2	- 14	18	7	11	16	- 5	- 31
URS Systems	11	5	8	10	- 2	- 20	11	5	6	8	- 2	- 25
	71-72 Bid High	71-72 Bid Low	71-72 Bid Bid	Feb.25,1972 Bid	One Year Net Change	One Year % Change	1971 Bid High	1971 Bid Low	1971 Bid Bid	Dec.31,1971 Bid	1971 Net Change	1971 % Change
OVER-THE-COUNTER												
Data General	78	19	77	29	+ 48	+ 2	65	19	55	21	+ 34	+162
Digitronics	8	2	3	6	- 3	- 50	8	2	3	4	- 1	- 25
Gen'l Automation	26	9	25	19	+ 16	+ 84	26	9	14	11	+ 3	+ 27
Informatics	15	6	10	9	+ 1	+ 11	15	6	9	8	+ 1	+ 13
Interdata	11	6	10	7	+ 3	+ 42	11	6	8	6	+ 2	+ 33
Optical Scanning	18	6	14	17	- 3	- 18	18	6	7	13	- 6	- 46
Recognition Equip.	26	9	13	21	- 8	- 38	26	9	13	14	- 1	- 7
Tally Corp.	16	8	11	13	- 2	- 15	16	6	8	12	- 4	- 33

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" April 21,1972 • VOL.7,NO.12 P.J.McGOVERN,EDITOR

Customer loyalty study

MAINFRAMER DEFECTIONS DECLINE WITH NEW PRODUCT SHIPMENTS AND TIGHTENED BUDGETS; CUSTOMER LOYALTY EXPECTED TO HIT ALL-TIME HIGH IN 1972

During the economic squeeze last year, some users may have looked to independent peripheral manuracturers or third-party leasing companies to stretch their EDP dollars; but they stuck by their mainframe manufacturer to a much higher degree than in 1970. And this trend, by and large, is continuing.

That's the gist of EDP Industry Report's sixth Customer Loyalty Study, reported in this issue (see summary profile, page 2). In the most extensive examination yet of user allegiance to vendor, by site, EDP/IR found:

- Most user defections involve IBM, as would be expected. Of the Giant's losses, HIS won a third, with NCR picking up 22%, Burroughs 16%, RCA 11%, and Univac 10%. On the other hand, IBM was the primary winner when users were disloyal to another manufacturer. Its share of this market ranged from 76% of the defecting NCR users and almost as many from Univac down to 52% of disloyal HIS customers and half those moving away from Control Data.

- Mixed-site loyalties -- a new feature of the EDP/IR loyalty study -- dropped during 1971. This indicates some shopping around on the part of these more sophisticated customers, but primarily is indicative of a trend toward fewer vendors. Such a situation probably should have been expected, because most mainframe manufacturers now offer product lines that cover the gamut of necessary computer sizes.

- In general, loyalty during 1972 is expected to hit an all-time high. A forecasting technique that proved to be quite accurate last year (EDP/IR May 14,1971) indicates that level or better loyalty is expected for all manufacturers except Univac. This mainframer not only has the RCA rental base to contend with; it also is running up against heavy defections of 9200 users, primarily to IBM. In its pace-setting move back to almost old times this year (EDP/IR Mar.30,1972), IBM will return to a better than 90% loyalty level for 1972.

These findings -- and the data in this issue -- are based on a detailed examination of computer sites that installed one or more computers during 1971.

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CUSTOMER LOYALTY STUDY: SUMMARY PROFILE

(Copyright 1972 - International Data Corporation)

	(1) Customers Gained From Competitors	(2) Customers Lost To Competitors	(3) Customers Re-Ordering From Vendor	% LOYAL* 1970 Actual	1971 Actual	1971+ Forecast	1972+ Forecast	% Competitive Gain or Loss** 1970	1971
BUR	43	9	54	80%	86%	87%	91%	+42%	+54%
HIS	64	31	117	73%	79%	78%	75%	+17%	+22%
NCR	47	21	67	77%	76%	71%	82%	+56%	+30%
RCA	21	7	9	48%	56%	72%	46%	+33%	+88%
UNV	22	33	51	43%	61%	70%	50%	-15%	-13%
OTHER	18	4	3	42%	43%	SS	SS	+61%	SS
SUB-TOTAL	215	105	301	64%	74%	75%	75%	+29%	+27%
IBM	66	176	819	80%	82%	81%	94%	-12%	-11%
TOTAL	281	281	1120	76%	80%	79%	90%		

* % LOYAL = (3)/(2)+(3) NOTE: 1971 Actual figures reflect data shown. Sample size is 1401 sites vs. 1595 sites for 1970 Actual figures. 1972+ Forecast based on data from 197 sites.

** % Competitive Gain or Loss = (1)-(2)/(2)+(3).

SS = Small Sample (Data not shown)

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The findings in this issue come from a detailed examination of more than 2200 site records in the Domestic Computer Installation Data File maintained by the International Data Corporation, publisher of EDP/IR. All of the sites studied added equipment or changed vendors during 1971. Some 1400 of them started and ended with a single vendor, although a change may have been involved. At these sites, the study shows:

+ All manufacturers had level or increased loyalty;

+ Burroughs, climbing to 86% loyalty, regained its right to claim the most loyal customers; IBM, HIS, and NCR were not far behind with 82%, 79%, and 76% respectively;

+ User loyalty during 1971 was very close to that expected from the 1970 survey of user intentions. The corresponding analysis for 1972, though based on a somewhat smaller sample, indicates continued improvement, especially for IBM, Burroughs, and NCR;

+ RCA and Univac showed substantial improvement during 1971, to 56% and 61% respectively; their outlook for 1972, however, has each of these now-merged user bases hitting only the 50% loyalty level;

+ The sample size for CDC and others is too small for conclusions.

Conditions and restraints

To measure "brand loyalty" in the computer business, EDP/IR's research staff analyzed reports from computer users who, according to IDC's Data File, took delivery of a system during 1971. We also analyzed reports of systems ordered for 1972 or later delivery. Results from these 1,401 sites for 1971 and 197 sites for 1972 and beyond are summarized on page 2. The table also shows the formulas used for calculating loyalty and competitive gain or loss.

In reviewing the results of this study (and those of previous ones, illustrated graphically on page 4), the reader is asked to consider very carefully the restraints and conditions involved:

- Only U.S. sites are studied. If foreign sites were to be included, manufacturers exceptionally strong or weak in European markets, for example, might show different results.

- All figures are based on number of sites. Naturally, for example, IBM would be more severely impacted by a user of several 360s moving to a competitor than it would be should a 1401 user switch vendors.

- The figures exclude sites that, at the beginning of 1971, had mainframes from more than one manufacturer or that installed (or had on order) equipment from more than one manufacturer during 1971. A special analysis of these "mixed" sites has been undertaken, however, and is discussed on page 7.

- First-time users are also discussed later (see page 6) and are not in the loyalty analysis, even though some of them might be considered "loyal" customers on the basis of their previous use of punched card or bookkeeping equipment.

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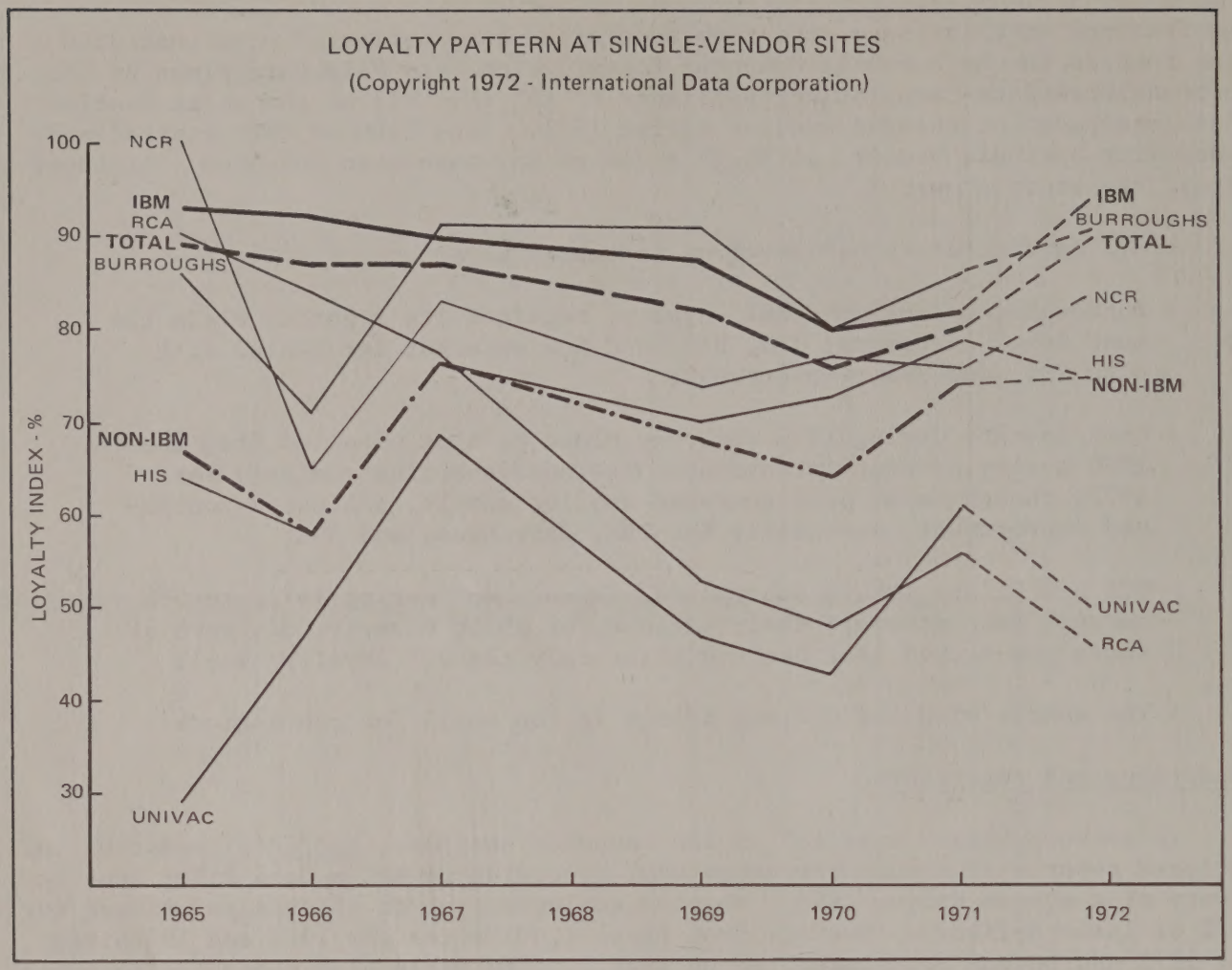

The loyalty cycle

The loyalty study discussed in this issue provides EDP/IR with its sixth such measurement since IBM first started deliveries of System/360 in 1965. Now, as IBM begins to replace its 360s with System/370, it appears that the company will return to the high level of customer loyalty it has drifted away from since the mid-1960s (graph, above).

Non-IBM manufacturers, as the graph also suggests, saw their loyalty ratings take a nosedive after first 360 deliveries, then perk up during the later 1960s as hard-won new customers began their reorder cycle. During the present upswing in the cycle (if there is one), most of the manufacturers seem to be moving in parallel; in other words, a larger portion of computer users seem to be satisfied with their vendor and hesitant to shift.

The graph shown should not be taken for more than it is -- a set of ratios calculated consistently over a period of six years. It certainly doesn't measure everything about vendor acceptance. On the other hand, it is a good general indicator of churning in a vendor's customer base. IBM, with the largest customer base, has been the most stable. Burroughs has tended to exceed IBM in loyalty, while NCR and HIS have held relatively smooth a few percentage points lower. Univac's low loyalty ratings are the result of its small system users -- first the 1004 and 1005, now the 9200; RCA just had trouble in general. With an

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established policy of second-sourcing IBM, RCA set itself up for the disloyalty the graph indicates; a computer system that is very simple to move to is also very simple to move away from.

The recycling machine

Since the number of IBM sites examined in the loyalty study was sufficiently large, EDP/IR was able to look at each major model in IBM's base as it did each of the other competitive mainframers. This examination provides an interesting look at some of the Giant's strengths and weaknesses. For example:

- There is a definite relationship between age, type of computer, and loyalty. IBM's 1620, first installed in September 1960, has the lowest loyalty rating of all IBM systems -- 45%. And its low-priced replacement, the 1130, also has a relatively low loyalty -- 64% (and two-thirds of the customers upgrading with IBM chose a System/3). Two other low-priced second-generation computers -- the 1401 and the 1440 -- had loyalty ratings of 66% and 75% respectively.

- All System/360 users are loyal. Ratings range from a "low" of 81% for the 360/20 up through the 360/25 and 30 at 88% and the 360/50 with 90%. Even the 360/20 users were more loyal this year than last, although more than half of them moved "up" to a System/3. In general, high ratings all through the 360 line would indicate that users have already made several loyal decisions over their computer-using career, and are firmly sold on IBM.

- IBM users of similar equipment follow many different upgrade paths, and IBM recycles its equipment among users as they upgrade. Loyal 360/20 users, for example, selected from seven alternatives (from an 1130 to a 360/40); over 70% of 360/30 users moved up to a 40, but there were four other selections, and the 370/135 wasn't even available during 1971; more 360/50 users (42%) moved to the 370/155 than any other single model, but 26% selected a 360/65 and only 16% opted for the sidegrade to a 370/145.

- Add-ons are still an important part of loyalty. At the loyal sites studied, 11% of the systems were additions to existing machines. These were primarily 360/30s and 40s. . . homes as it were for those machines replaced by 370/145s, for example. In the total cycle, one imagines a 360/50 user replacing his system with a 370/155, with the 50 replacing a 40 at another site, which replaces a 30, which replaces a 25, which replaces a 20, which replaces a 1401 . . . which is donated to a school or prison.

This computer cycle, especially the 360/370 portion of it, with an examination of method of acquisition, etc., is the subject of a major IDC study just getting underway. When the results are in, we will be presenting more about the movement of systems between users.

Industry trends and characteristics

This year, for the second time, EDP/IR studied customer loyalty by industry, looking at users as IBM users or non-IBM users. The profile of this comparison is shown on the next page, along with a few observations.

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INDUSTRY LOYALTY PROFILE: 1971 vs. 1970

	SIC	IBM LOYALTY* 1:n	1971	1970	NON-IBM LOYALTY* 1:n	1971	1970
Agriculture,Mining & Construction	01-17	21:4	84%	85%	5:5	50%	55%
Chemical & Petroleum Processing	20-31	159:22	88	83	40:20	67	72
Durable Products Manufacturing	19,32-39	137:28	83	80	49:21	70	51
Transportation & Utilities	40-49	47:11	81%	84%	15:3	83%	78%
Wholesale & Retail	50-59	100:18	85	81	27:7	79	60
Finance & Insurance	60-69	128:19	87	89	71:13	85	76
Non-Professional Services	70-79	5:2	71	73	2:2	50	64
Health-Hospitals	80	20:6	77%	94%	12:1	92%	71%
Colleges & Universities	82	54:28	66	63	8:6	57	29
Computer Services	89,73	74:11	87	82	33:7	83	72
Federal Government	91	5:2	71%	71%	8:6	57%	23%
State Government	92	14:1	93	82	5:4	56	54
Local Government	93	24:18	57	66	18:5	78	92
Unknown	xx	31:6	84	--	8:6	57	--
TOTAL		819:176	82%	80%	301:105	74%	64%

*LOYALTY = 1/1+n

- Non-IBM users displayed improved loyalty in 9 of 13 industries, showing impressive gains in the manufacturing, wholesale & retail, health, education, and Federal Government sectors.
- At the same time, IBM gained in six sectors but lost ground in the health and local government sectors, both of which are among those with the most rapid growth.
- For 1971, IBM's most loyal sector was state government (93%) vs. health (92%) for the non-IBM manufacturers. IBM's weakest sector was local government (57%) vs. agriculture, mining & construction, and non-professional services (50%) for the others.

Bring on the newcomers

Without the influx of "new blood" into his user base, the computer manufacturer must rely simply on upgrades for new business. This isn't necessarily fa-

	NEW SITES 1970	1971
BUR	4%	3%
CDC	~2%	~1%
HON	8%	10%
NCR	18%	15%
RCA	~1%	1%
UNV	8%	7%
OTH	~2%	~1%
IBM	59%	64%
Sample	446	738

	POPULAR FIRST SYSTEMS CPU	% of Mfg.	% of All	Sample
IBM	Sys/3	58%	37%	273
NCR	C-100	65%	10%	71
IBM	360/20	12%	8%	56
HIS	115	72%	7%	53
UNV	9200	80%	6%	41

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tal for a single manufacturer, but would eventually spell trouble for the industry. To any given mainframer, new business comes from one of two places -- the true first-time user, and the defector from another manufacturer. To the industry as a whole, of course, the first-time user is all that counts. As reported previously, the dollar volume of business from these first-time users is on the decline, but the business is still important because of the upgrade cycle.

New users are particularly important to IBM and Univac, both of which have competitive net losses as a rule. IBM has been working on this problem, and its large base of System/3 users will be important to watch when the first upgrade comes around. Univac's first-user machine -- the 9200 -- has been around longer, and it is seeing a high level of defections, many to IBM's System/3 and the apparent guaranteed upgrade path that IBM will supply.

To date, IBM has been extending the System/3 upwards, making it almost a sub-family of small machines, and allowing upward compatibility with the 360/25. Eventually, then, IBM will be forced to guarantee the loyalty of its S/3 users with a small-scale machine in the 370 family. Because of this, rumors about a 370/125 crop up every few days. The ultimate announcement of such a computer is virtually certain; when all the timing considerations are examined, however, it still seems to EDP/IR that IBM will not be delivering significant quantities of such a system until late 1973 or early 1974.

In the thick of things

The great bulk of computers are at sites where only one vendor's machines are used, so the loyalty ratios discussed previously are important. Some of the largest and most valuable computer sites, however, have computers manufactured by two or more different suppliers. To give readers a better picture of what goes on at these mixed sites, EDP/IR has put together the following data:

ANALYSIS OF MIXED SITES

	1970						1971					
	C	L	N	D	S	MSL	C	L	N	D	S	MSL
BUR	7	14	3	1	25	-.92	3	12	9	4	28	+.04
CDC	5	3	4	5	17	-.06	3	4	6	1	14	+.14
HIS	4	13	13	2	32	+.13	6	17	13	6	42	+.10
NCR	0	4	4	3	11	-.55	3	7	6	2	18	+.17
RCA	6	10	15	2	33	+.09	3	8	6	5	22	-.09
UNV	8	8	15	2	33	+.15	2	5	18	9	34	-.84
OTH	6	4	2	2	14	+.78	1	3	4	0	8	+.13
SUB.	36	56	56	14	165	+.22	21	56	62	27	166	-.11
IBM	10	28	20	17	135	+.40	4	45	39	15	103	-.15
TOTAL	46	144	76	34	300	+.30	25	101	101	42	269	-.12

C=CRACK (First time into site); L=LOYAL (Upgrade or add); S=Sample Size;
N=NOT LOYAL (Retained old, but added new vendor's equipment)
D=DISLOYAL (Replaced one manufacturer with another)
MSL = MIXED-SITE LOYALTY (2C+L-N-2D/C+L+N+D)

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The calculation for "Mixed-Site Loyalty" is presented more as a reference for comparison rather than an absolute. EDP/IR tried several calculations based on the data -- all gave similar results in terms of direction of movement, but the actual data is presented so that readers can experiment with other measurement techniques. Questions or comments from readers are welcome.

Using the MSLs as calculated, however, we find some trends worth noting. All manufacturers except NCR had a decrease between 1970 and 1971. This is probably indicative of stiffened competition, more shopping around on the part of users, and a general trend toward the reduction in the number of mainframe vendors at any site. Other observations are that HIS and Burroughs seem to have the best loyalty at mixed-vendor sites; Univac and RCA, as in the case of single-vendor sites, come out with a trend toward lack of user loyalty.

What about RCA users?

Following RCA's withdrawal from the computer industry in 1971, there has been a large question as to what will happen to users with RCA equipment . . . especially those with equipment on rent and now part of Univac's customer base. To gain more insight into the situation, EDP/IR telephoned 20 sites that had ordered RCA equipment for delivery during the second half of 1971.

Seven of the users had previously been with IBM, and five of these already had decided to return to Mother. One of them decided to keep his RCA 2 while the other canceled his order for a 2 and went back out for competitive bids. An additional two non-RCA users had ordered equipment: One, who previously had a GE 215 decided to keep his 70/35; the other, a first-time user, canceled his order for an RCA 2 and took delivery of a B-2500.

Of the eleven users contacted who previously had been RCA customers, one is carefully looking at the Univac 9700, two are back out for competitive bids, three have already ordered IBM/370 computers, and five are going to keep their RCA equipment for several years. Thus, based on this admittedly small sample, Univac can expect a minimum of 30% capture of the RCA base it acquired on the first of this year. Considering the users who are still open to suggestion, this percentage might be raised to 50%. But more than half would appear to be a super-optimistic assumption.

So what?

Just as there is no simple way to say that one particular computer model is "better" than another -- especially if they are in the same price ballpark -- there is no single measure of effectiveness for a mainframe manufacturer. But vendors do gain certain reputations, and EDP/IR thinks the annual loyalty study contributes to this overall understanding of mainframe manufacturers.

So, with another of these studies now made public, the summary is still that Burroughs has loyal customers; IBM is hard to beat but most competitive captures come from the industry Giant; customer loyalty in general seems to be increasing. The most serious suggestion in this year's study is that Univac is having trouble with its entry-level customers. This has been the case for several years, but was dismissed as "that 1004." Now, the same lack of allegiance seems to apply to 9200 users, and that is more significant. This could be a suggestion that users would like to see a full line of Univac computers.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" April 28,1972 • VOL.7,NO.13 P.J.McGOVERN,EDITOR

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SPECIAL: Installed Base by Manufacturer, page 3

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IBM REPACKAGES 360/20 AS REMOTE-BATCH TERMINAL IN ITS DOUBLE-EDGED ATTEMPT TO PUSH COMMUNICATIONS AND PREVENT RETIREMENTS

In a very definite move to milk maximum revenue from older equipment while continuing its commitment to communications, IBM last week announced a "versatile communications terminal" dubbed the 2922. Even though IBM will officially say only that the product contains "major components from returned equipment," there is no real secret about the 2922: It's a stripped-down 360/20 at half price. Actually, the system price is less than half that for the equivalent product in the System/360 price book, and the monthly payments under the extended term lease plan are pegged at 55% the old rental charges.

This appears to be one more element in a scheme that includes emphasis on communications, repackaging of discontinued equipment, and longer term lease plans that save the customer money but tie him to IBM for at least two years. During the last two months, IBM has announced:

- 3705 communications controller/processor. This "combination of logic circuitry and core memory," as IBM describes it, may or may not be manufactured from returned 360 components. It definitely is receiving good customer acceptance, and has several minicomputer manufacturers realizing it will offer competition.

- Extended Term Plan (ETP) for selected new products. For users who will sign up for a minimum two-year lease, the ETP offers a 13% to 15% discount from rental, which is still available. Actually, it looks to EDP Industry Report like a 17% premium for short-term cancellation privileges. In addition to the two communications products discussed in this report, the ETP was also offered on IBM's 3881 optical mark reader announced just at press time.

- 2922 programmable remote job entry terminal. This stripped-down 360/20-2, which will start shipping in June, gives the user 8K of 3.6-microsecond memory, a 500-line-per-minute printer, and a 500-card-per-minute reader. It operates over telephone lines at speeds to 7,200 bits per second with 360s, 370s, or other terminals.

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ESTIMATED AND PROJECTED COMPUTER TERMINALS IN THE UNITED STATES

Type of Equipment	In Use, 1970	In Use, 1975	Growth Factor
Interactive Keyboard Terminals	126,230	441,500	3.5
Alphanumeric CRT Terminals	34,500	190,000	5.0
Graphic CRT Terminals	3,500	26,000	7.4
Small/Medium Computer Terminals	2,900	45,000	15.5
Remote-Batch Terminals	5,250	23,500	4.5
Data Collection Terminals	27,900	96,000	3.4
TOTAL	200,280	822,000	4.1

There's no question about why IBM is continuing to introduce products for the data communications market. Terminal equipment used with computers (table above) will continue to grow at 30% to 35% annually for at least the next five years in the trend toward distributed computing, and so will the interconnection equipment needed to tie these into central processing systems.

IBM certainly didn't neglect this market in the past; but in some areas -- programmable front-ends and remote-batch or intelligent terminals, for example -- its products haven't been well known and have been considered somewhat weaker than those offered by minicomputer manufacturers or independent peripheral suppliers.

And the new products certainly aren't technically advanced, since they are based on System/360 technology. But they will give a boost to the other companies competing for the business . . . Interdata, Honeywell, and General Automation in the minicomputer front-end area, Data 100, M&M Computing Industries, MDS/Atron, and Westinghouse with RJE or intelligent terminals.

IBM's announcements are good news for relative newcomers, also. Just last week, for example, Digital Equipment Corp. held a press seminar to build up its image as a company that understands communications. When EDP/IR mentioned that the 3705 was receiving very positive initial acceptance (see below), a DEC spokesman said: "Great! That's an area where we are starting a big push, and IBM's educational efforts are appreciated."

User acceptance of the 3705

Several weeks after IBM announced its 3705 programmable controller (EDP/IR Mar.3,1972), the International Data Corporation, publisher of this newsletter, surveyed a reasonable cross-section of 370/155 and 370/165 users. One of the subjects discussed was IBM's 3705.

About three-fourths of the sample knew about the 3705, coincidentally close to the portion of all large computers used in a communications environment, but surprisingly low for a supposedly sophisticated group. This might be the result of too early a survey date or some other slight bias. In any event, the results

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are interesting, and show a significant amount of pent-up demand for a product of this type -- from IBM. Here's a brief summary of user reaction to the product:

User Acceptance of IBM 3705 Programmable Communications Controller

Have present plans to acquire one or more	39%
Considering acquisition, but presently undecided. . .	13
Definitely not going to acquire at present time . . .	24
Unfamiliar with product at time of survey	24
	100%

From the above, it is clear that IBM quickly picked off half the available market among its customers, but that almost half the market was initially open to non-IBM manufacturers. And the market is even larger than a casual glance might imply. Of the users who plan to acquire a 3705, many will be getting more than one unit; the average number of units per site is somewhat over 1.5.

There's a warning in the data, however. The 370 users were also asked if they would rent the equipment, or take advantage of IBM's extended term plan. An overwhelming number -- well over 80% -- said they had ordered the equipment on ETP, or would use the ETP if they ordered it. IBM's competitors, thus, are forewarned to move rapidly . . . or be left looking at two-year leases out there along with the independent disk drive manufacturers.

The 2922, whatever it is

Since IBM isn't calling the 2922 a computer, and since the "9" digit in the number chosen for this communications terminal usually designates a specialized or custom product in IBM terminology, it probably shouldn't be compared directly to the product it once was. But EDP/IR's research staff has priced it out, just the same. Here's what we came up with:

	Rental/mo.	ETP/mo.	Purchase
2020-C2 8K processor	$ 775		$ 24,500
1403-2 printer	750		28,000
2501-A1 card reader.	195		11,000
Various attachments/adapters . .	780		28,000
360/20, Model 2	$2,500		$ 91,500
2922 with printer & card reader.	$1,634	$1,390	$ 43,525

About the only option on the 2922 (memory can be only 8K) is the 2152 console keyboard adapter for Selectric I/O typewriter. IBM describes uses of the 2922 as remote job entry, making inquiries into a computer's data base, and "teleprocessing applications that require extensive printouts, such as parts listings, at plants or warehouses distant from a central computer." So that's what's happening to those 20s being replaced by System/3s.

SPECIAL: WORLDWIDE INSTALLED COMPUTER BASE OF U.S.-BASED MANUFACTURERS

For the first time, EDP/IR presents on pages 4 and 5 a compilation of the installed base of the top 15 computer manufacturers with headquarters in the U.S. Readers are urged to consult the explanations and cautions continued on page 6.

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	United States:							
	# CPU	% Sub(A)	% Total	$M Value	% Sub(A)	% Total	# CPU	% Sub(
IBM: Group A	36,362	66.8		18,931	72.3		20,246	55.
Group B	903			173			452	
Subtotal	37,265		42.5	19,104		68.6	20,698	
HIS: GE (A)	1,195			753			5,277	
EDP (A)	3,386	8.4		1,350	8.0		1,753	19.
CCD (B)	2,525			212			770	
Subtotal	7,106		8.1	2,315		8.3	7,800	
Univac (A)	5,124			1,296			3,874	10.
RCA (A)	1,052			896			61	.
Subtotal	6,176	11.4	7.1	2,192	8.4	7.9		
Burroughs (A)	2,253	4.1	2.5	1,180	4.5	4.2	1,219	3.
CDC: Group A	487	0.9		852	3.3		323	0.
Group B	1,730			218			853	
Subtotal	2,217		2.5	1,070		3.9	1,176	
NCR (A)	3,837	7.0	4.3	530	2.0	1.9	3,250	9.
XDS: Group A	328	0.6		232	0.9		69	0.
Group B	888			136			142	
Subtotal	1,216		1.4	368		1.3	211	
DEC: Group A	161	0.3		75	0.3		67	0.
Group B	12,153			273			3,698	
Subtotal	12,314		13.9	348		1.3	3,765	
Hew. Pack. (B)	2,510		2.8	87		0.3	600	
Varian (B)	2,293		2.6	47		0.2	272	
Data Gen. (B)	1,734		2.0	18		)	195	
Gen. Auto. (B)	1,165		1.3	25		) 0.2	135	
Interdata (B)	740		0.8	13		)	229	
Comp. Auto. (B)	571		0.7	6		)	45	
Others: (A)	283	0.5	0.3	89	0.3	0.3	63	0.
(B)	6,311		7.2	455		1.6	814	
Subtotal: (A)	54,468	100.0	61.9	26,184	100.0	94.1	36,202	100.
(B)	33,523		38.1	1,663		5.9	8,205	
TOTAL	87,991		100.0	27,847		100.0	44,407	

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WORLDWIDE INSTALLED BASE (January 1, 1972)
International Data Corporation)

:side the U.S.				Worldwide:					
% Total	$M Value	% Sub(A)	% Total	# CPU	% Sub(A)	% Total	$M Value	% Sub(A)	% Total
	9,996	70.6		56,608	62.4		28,927	71.7	
	101			1,355			274		
46.7	10,097		69.3	57,963		43.7	29,201		68.9
	925			6,472			1,678		
	649	11.1		5,139	12.8		1,999	9.2	
	56			3,295			268		
17.6	1,630		11.1	14,906		11.3	3,945		9.2
8.8	1,015	7.2	6.9	8,998			2,311		
.1	52	.4	.4	1,113			948		
				10,111	11.2	7.6	3,259	8.0	7.7
2.7	598	4.2	4.1	3,472	3.8	2.6	1,778	4.4	4.2
	486	3.4		810	0.9		1,338	3.3	
	55			2,583			273		
2.6	541		3.7	3,393		2.6	1,611		3.8
7.3	345	2.5	2.4	7,087	7.8	5.4	875	2.2	2.1
	47	0.3		397	0.4		279	0.7	
	24			1,030			160		
0.5	71		0.5	1,427		1.1	439		1.0
	34	0.2		228	0.3		109	0.3	
	90			15,851			363		
8.5	124		0.8	16,079		12.1	472		1.1
1.4	21	)		3,110	)		108	)	
0.6	5	)		2,565	)		52	)	
		)	0.2		)	7.9		)	0.6
0.4	2	)		1,929	)		20	)	
0.3	3	)		1,300	)		28	)	
0.5	4	)		969	)		17	)	
0.1	1	)		616	)		7	)	
0.1	10	0.1	0.1	346	0.4	0.3	99	0.2	0.2
1.8	80		0.5	7,125		5.4	535		1.2
81.5	14,157	100.0	97.0	90,670	100.0	68.5	40,341	100.0	95.1
18.5	442		3.0	41,728		31.5	2,105		4.9
100.0	14,599		100.0	132,398		100.0	42,446		100.0

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The somewhat overpowering array of numbers really isn't difficult to understand and use. It is based on the yearend 1971 Computer Census tables published recently in the Review and Forecast issue (EDP/IR Mar.30,1972). And with one minor exception, the figures for Number of CPUs are taken directly from the R&F. (In the case of HIS, we have provided for some Bull-Gamma computers installed outside the U.S.)

The Dollar Value figures are based directly on the Numbers, with appropriate provision for purchase-to-rental ratios in the case of Group A computers. The letters (A) and (B) designate Group A and Group B computers according to the definitions used consistently by EDP/IR:

> Group A Computers -- General-purpose computer systems, predominantly byte- or character-oriented, plus large word-oriented scientific machines (in IBM nomenclature, all models except the 1800 and System/7), predominantly rented or leased.
>
> Group B Computers -- Those computers, which although general-purpose in central processor design, tend to be used for one dedicated application at a given site. They are predominantly purchased and include all minis and most medium-priced special computers, such as GE/PAC process control computers, but not special military computers such as the IBM 4 Pi.

The computers installed by each manufacturer are broken down by Group A or B (and, in the case of HIS, by original manufacturer before the merger with GE) and by location (U.S. or outside). Within each geographical breakdown, numbers and dollars are expressed as percentages both of all computers and for Group A only. A quick look at the subtotals and the placement of the "100.0%" expressions should make this readily clear.

Average system values

One useful tool when examining various computer manufacturers is to look at the differences or similarities in the average value of their installed systems (Dollar Value divided by Number of CPUs). A few observations:

- Among Group A computers, IBM has a considerably higher average value than all non-IBM manufacturers taken as a group. Burroughs is roughly the same, and only RCA and CDC have higher averages.

- Group A computers in the U.S. tend to have a higher average value than their counterparts abroad. This generally reflects the larger companies in the U.S. and the associated greater paperwork needs.

- Group B computers, on the other hand, tend to have a higher average value outside the U.S. This is a function of at least two things: Proportionately more complex control systems are used abroad, especially in Europe; stripped-down, OEM versions of minicomputers are much more plentiful in the U.S.

- There is a tremendous difference in share of market, depending on whether number of computers or dollar value is examined. One reason for this is that, although there are almost half as many Group B computers as there are Group A, the Bs are worth only 5% as much.

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Who's on third?

As detailed as the accompanying table seems to be, it requires a certain amount of caution in use. That's especially true when it comes to companies active in the minicomputer market. The numbers are reasonable, but the dollar extensions are more relative than exact. Further details on this sector will be presented in a subsequent issue. But the chart does serve it's purpose -- to show the scale and range of the computer environment.

+ +

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Effective June 30, 1972, *EDP Industry Report*'s subscription price will be $95 a year, reflecting the first price change since mid-1968. As you know, all publishing costs -- including printing and postage -- have gone up substantially during the past four years. Even so, *EDP/IR* continued to deliver a more valuable product and service:

+ 25% more editorial material, including new features such as the Dedicated Application Computer Census;

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+ Field user surveys, such as the pace-making user reaction to IBM's fixed-term lease, and the story in this issue about IBM's significant new thrust into communications;

+ Annual cross-referenced indexes.

Between now and June 30, users may prepay extensions to their current subscriptions at current rates, listed below. Under this provision, you can save up to 35% off the new annual rate by extending your current subscription at the present three-year rate. Extensions of one, two, or three years will be added to the current unexpired portion of your subscription, freeing you of additional renewal cost or bother for years to come.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

ADVANCED DIGITAL SYSTEMS, INC.

Advanced Digital Systems, Inc., 146 West Main St., a firm that has designed and is commencing the manufacture of library control systems for magnetic tape libraries, filed on March 29 for 150,000 shares of common to be offered for sale at $8 per share max. Of the net proceeds, $310,000 will be used for finance of leases and the balance for working capital and other purposes. Underwriters headed by J.D. Winer & Co., Inc. 5 Hanover Square, New York, N.Y. 10004.

CREDIT SYSTEMS, INC.

Credit Systems, Inc. (Name to be changed to Colmar Systems, Inc.), Route 309 and Davance Lane, Colmar, Pa. 18915, a company engaged in the design, production, and marketing of an electronic credit authorization system to retail establishments, filed on March 28 for 300,000 shares of convertible preference stock ($.15 par) with Series A warrants to purchase an additional 300,000 shares, to be offered in units each consisting of one share and one warwarant. Proceeds of the offering, at $11 per unit max., will be used to discharge a portion of indebtedness to company's founders and for working capital. Underwriters headed by Suplee-Mosley Inc., 1700 Market St., Philadelphia, Pa. 19103.

DATUM INC.

Datum Inc., 170 East Liberty Ave., Anaheim, Calif. 92801, a manufacturer of peripheral equipment for the minicomputer industry, on March 29 filed for 329,654 shares of common, of which 200,000 are to be offered for public sale by the company and 129,654 (being outstanding) by the holders. Of proceeds, $240,000 will be for research and development, the balance for working capital. Underwriters for the offering, at $6 per share max., headed by Morgan, Olmstead, Kennedy & Gardner, Inc., 606 South Olive St., Los Angeles, Calif. 90014.

DATA DIMENSIONS, INC.

Data Dimensions, Inc., 51 Weaver St., Greenwich, Conn. 06830, a company offering EDP equipment leasing, consulting, and programming, filed on March 30 for 85,000 outstanding shares of common to be offered from time to time at $3 per share max.

DCS COMPUTER SERVICES, INC.

DCS Computer Services, Inc., 19 Rector St., New York 10006, a company that renders computer hardware and software as a service to various markets, filed on March 27 for 150,000 shares of common to be offered for public sale ($5 per share max.) by North American Planning Corp., 230 Park Ave., New York 10017. Proceeds will be used for working capital and general corporate purposes.

STANDARD COMPUTER CORP.

Standard Computer Corporation, 647 E. Young St., Santa Ana, Cal., a company that provides computer time to a number of unrelated users, filed on Mar. 31 for 231,008 outstanding shares of common ($1 per share, max.) that may be offered from time to time by the holders at prices prevailing at the time of sale.

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MAY 25 1972

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" May 19,1972 • VOL.7,NO.14 P.J.McGOVERN,EDITOR

At the crossroads

SPRING JOINT COMPUTER CONFERENCE CONSIDERED A GOOD SHOW; MORE BUSINESSLIKE ATTITUDE PREVAILED; FUTURE JOINTS SCHEDULED FOR MAJOR CITIES

The boardwalk flanking Atlantic City's Convention Center was new this year, but many of the 14,000 faces were the same as the Spring Joint Computer Conference wound down for the last scheduled time on the southern New Jersey shore.

The number and size of exhibits were down; and most of the work-hard/play-hard atmosphere was gone. The paid attendance of 7,257 exceeded that of either 1971 Joint Computer Conference; technical sessions seemed to attract more atten tion than usual. Outwardly, most of the people at Spring Joint seemed to be going through the same old motions, much like the remanent of pre-Depression society that still haunts the older Boardwalk hotels.

But the Show was not the disaster it might have appeared to be in a first, casual glance . . . it was an orderly OEM/vendor-meet-vendor affair at which a significant amount of business was transacted, a lot of good contacts were made. All-in-all, it was a good show, a businesslike show.

Even the technical sessions reflected the maturity that was coming to the computer industry as it celebrated its 21st annual Spring get-together. The "blue sky" papers of just a few years ago were replaced by discussions of the possible. Most descriptions of future technology contained cost estimates as well as possi-ble technological improvements. A much higher degree of pragmatism prevailed.

Indeed, an era ended with Atlantic City-72. SJCC was a fitting interlude . . . a welcome relief from the hectic days of the late 1960s or the nervous -- almost desparate -- atmosphere of last year. This was especially fitting as the JCCs shifted their emphasis away from captive crowds at convention locales to major population centers. Los Angeles . . . Philadelphia . . . San Francisco . . . Chicago . . . and maybe a single week-long convention a year.

As another indication of change, Afips -- the "super" society that runs the Joint Computer Conferences -- announced that vertical "adjuncts" will be held in conjunction with future Joints. In Anaheim this fall, there will be a day-and-a-half program on banking (see page 6) plus special emphasis on manufacturing and health care. There is also talk of some regional technical sessions, especially if the decision -- due in July -- is for a single JCC each year.

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The elements of change

The changing nature of Joint Computer Conferences, of course, can't help but reflect the change that is occurring within the computer industry. Even as the exhibit floor becomes a vendor meeting ground, the conference rooms in the background reflect more of the actual state of affairs. But more on that below.

Afips has broken out the attendance figures from the last three Joints, and points to the uptrend in total paid attendance even though the number of exhibtors -- and the average booth size -- has been on the decline.

ATTENDANCE AT RECENT JOINT COMPUTER CONFERENCES

	Atl. City-71	Las Vegas-71	Atl. City-72
Non-Paid (Exhibitors & Guests)	14,812	9,820	6,602
Paid (Full + Exhibits only)	6,548	5,465	7,257
TOTAL	21,360	15,285	13,859
Percent paid	31%	36%	52%

Thus, more than half the registrants this spring were paid, probably for the first time in recent history. This is partly a reflection of the smaller exhibits. The number of exhibitor staff personnel was less than 2,000 in Atlantic City in 1972 compared to more than 5,000 the previous year. Likewise, the number of exhibitor guests was down from 8,500 to less than 4,000. Fewer end-user exhibits, fewer guests.

And even the paid figures can't be compared without extreme care. Afips this year inaugurated a new, "one-day" type of paid registration for either the exhibits only or for the full show. And almost 3200 people -- some 44% of the total paid registration -- fell into this category.

An Afips spokesman says "we were encouraged that even in Atlantic City the one-day registration policy had an impact. It should have even more impact this fall in Anaheim, a major population center." Only 22% of the one-day registrants signed up for the technical sessions, however. And that is the portion of the program Afips is looking to most hopefully.

Developing technology -- more of the same?

The technical sessions are usually devoted to technological aspects of computer design or to esoteric applications. As such, these sessions are important to the computer industry. But their role seems to be changing. Once upon a time they provided "long hairs" a forum upon which to expound their latest theories . . . a chance to be dramatic. Today, of course, long hair has no relationship with brain power and, as never before, these sessions serve more as a control mechanism . . . an opportunity for the industry's thinkers to compare notes and see if they are heading in the same direction.

At times in the past, the scope of scientific thinking seemed as diverse and broad as the electromagnetic spectrum. And in Atlantic City this year, to be sure, there were many different streams of thought. But there was a difference. This year, there was an overall direction . . . and that was pragmaticism. Presentations still contained formulae, but most also contained cost estimates.

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Not only has the computer industry in general become too large for dramatic change. Most parts of the industry are in the same fix. At least that's the way EDP Industry Report interprets what it heard in session after technical session during Spring Joint. Another way of expressing the same observation might be to say that the prognosticators have gotten older and more realistic . . . and the youngsters with dreams either haven't surfaced or have accepted their existence with a certain amount of perspective.

This isn't meant to be a statement that there will be no change or that the sparkle has left the computer industry. Indeed, the industry is in for dramatic change in some areas, especially those related to data entry, communications, and large data base applications. But there is an ever-growing barrier to drastic change. Call it inertia; call it protection of investment; call it maturity.

The last five years, the next ten years

The theme of the Spring Joint, shown above, was carried through in most of the sessions. It was summed up well by Jacob T. Schwartz, of New York University, the technical program chairman:

> The last decade has witnessed great progress in computer technology. Component manufacturing technique has moved forward rapidly, making reliable fast circuits available at drastically reduced costs. Instruction processing rates have increased by factors of ten and more; today's inexpensive minicomputers have capacities comparable to those of the largest machines of 1960. Storage disks in their various forms have made it possible to bring masses of data 'on-line,' and have opened paths for the development of highly responsive total systems of many types. In software, progress has been less rapid but still impressive.
>
> The coming decade's efforts should bring equally significant accomplishments. Electronic memories of many millions of bytes, inexpensive display devices available *en masse,* and important new programming techniques should all be developed.

One of the speakers -- R.B. Lazarus from the University of California, Los Alamos, New Mexico -- put these developments a little more into perspective when he discussed computer architecture and very large problems:

> Consider the approximately 16 year interval between the IBM 701 and the CDC 7600. A typical large problem ran for about ten hours on the 701; a typical large problem runs for about 600 minutes on the 7600.

He goes on to point out that the amount of work being done is perhaps 1000 times as much, and that the cost is only 5 times more, "leaving an improvement factor of 200." This implies an improvement factor of some 40% a year, which keeps coming along "for free," as it were. He uses a continuation of this argument to imply that substantial architectural change in computers is not likely unless substantial speed improvements can be expected. And "substantial," he says, means a "factor of four in speed-to-cost over the competition after correcting for delivery date at 40 percent per year, compounded."

This doesn't bode well for changes in computer architecture. It must be remembered, of course, that similar statements were probably made ten years ago. The important observation in Lazarus' comment, it seems to EDP/IR, is that little

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in the way of cost reduction can be expected. Indeed, this point was made by more than one speaker. In a paper called "LSI -- Implications for future design and architecture," two scientists from IBM's Thomas J. Watson Research Center discussed the cost savings that could be expected from technilogy, and the associated "cost of ownership" that includes the non-hardware expenses of computers. Although by the late 1970s, they say,

> the cost of some of the key componentry could be one-fiftieth that of today's cost, the overall cost ratio (today:late 70s) is about 6 to 1. With peripheral equipment added in, the ratio might be more nearly 3:1.
>
> But this view ignores non-hardware expenses. If we look at system cost as classic "cost of ownership," we see that the static costs of planning, programming, and operations bring the cost reduction to only 28%. Of course, 28% is not to be callously ignored.
>
> However, even "cost of ownership" is not the total cost. For example, data acquisition, its conversion to machine-readable form, and preparation of machine output for an ultimate consumer's use may cost a substantial amount in comparison with "cost of ownership." Further, the increasing complexity of our present systems design is adding to the costs of installing, extending, and maintaining systems and of adding new applications. So, even the 28% is an overly optimistic estimate.

More ways to remember . . . but the disks will keep spinning

On the one hand, the $17 billion memory equipment business is the most unstable sector in the entire computer industry. Product life cycles are relatively short; new technology acts as a deterrent force to independent equipment manufacturers' profits; IBM seems to set the pace and change it at will.

So on the other hand, the message from Spring joint was mixed. IBM authors and others essentially projected a niche for new technology but a continuation

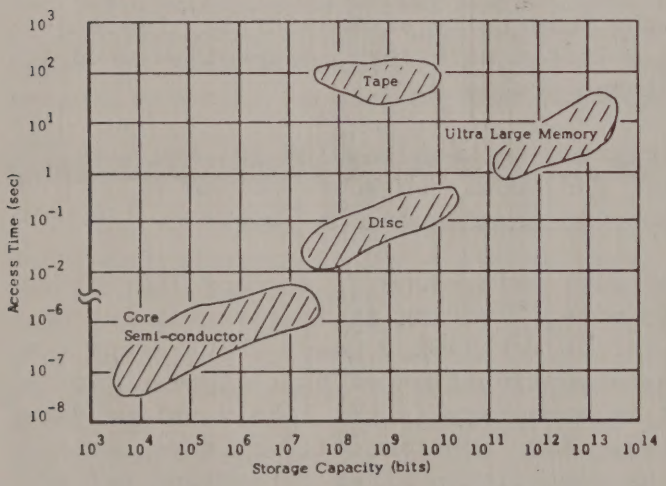

Figure 1—Storage capacity vs. access time for memories in the computer system hierarchy

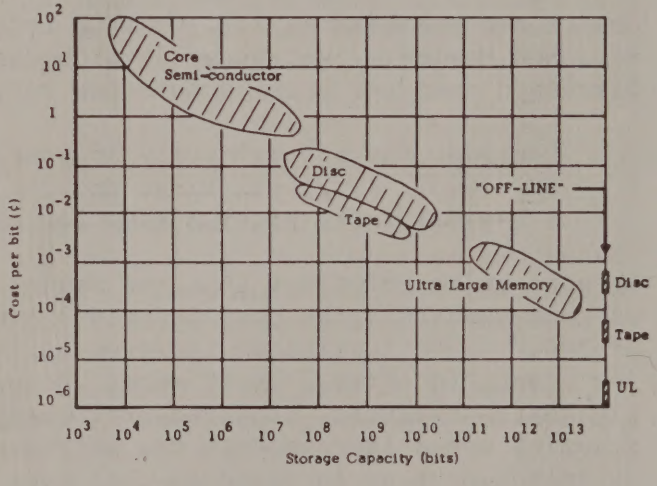

Figure 2—Storage capacity vs. cost per bit for memories in the computer system hierarchy

Memory Hierarchies -- a comparison of various memories as presented at SJCC-1972 in a paper on Ultra-large Memories by William A. Gross, Ampex Corporation

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of the current trend . . . at least in principle. The two IBMers -- John M. Harker and Hsu Chang of the Systems Development Division in San Jose -- note in their paper that their predictions "are, of course, individual and not corporate, but hopefully the ideas have been drawn more from objective observations and published fact than from personal bias."

The two authors stress the role of the disk pack in system reliability since "data availability is not jeopardized by the failure of a single drive." But they go on to note the changing role of this type of memory device. "The use of disk packs as a way of loading and unloading user jobs can be expected to diminish at installations with extensive operating systems since these systems view the peripheral hardware as a resource which is allocated and scheduled without operator intervention."

And, after discussing all the technical problems, they seem to predict at least one more "generation" of disk drives after the 3330, maybe two:

> Given the momentum of magnetic disk technology and the availability of new materials and fabrication technologies to provide a significant increase in density, it is unlikely that any other technology will displace magnetic recording in the coming decade as a principal data storage media for the industry. For some other technology to displace it, probably the alternative method would have to provide functions we do not forsee rather than merely a more economical or efficient means of storage.
>
> In summary, the picture is one of a continuing evolutionary development of present disk file technology with at least an order of magnitude increase in storage density as well as total storage volume, and a corresponding decrease in the cost per byte stored. [emphasis added]

In addition to these expected improvements in disk technology, the IBM authors single out two factors that will be evident in computer storage development over the next ten years:

- First, there will be a substantial cost reduction in semiconductor memory or an alternative such as magnetic bubbles. Neither, however, is very likely to approach disks on a cost-per-bit basis.

- Second, extremely large capacity on-line magnetic tape devices will become available, such as the Ampex Terabit Memory System or other systems of mechanically accessed tape reels. Although we will see increasing variation in the possible characteristics of such large capacity storage devices, they will probably all characteristically have a lower cost per bit than disks during this decade and substantially poorer random access capabilities.

In a companion paper to the one from IBM authors discussed above, William A. Gross of Ampex discussed ultra-large storage systems in more detail (see chart, page 4). Part of his paper is a discussion of the factors involved in bringing such a memory system to the marketplace. He summarizes by noting:

> It has been my experience, during fifteen years in the data processing industry, that seven to ten years and seven to ten million dollars is a ballpark estimate of the cost required to move a system, such as an ultra-large storage system from conception to completion and delivery.

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Talking about his own company's Terabit Memory, Gross points out that it uses the transverse recording technique developed 15 years ago for video recorders, and widely used since. "This appears to be the only system available in the next few years which meets all of the specifications" outlined in his paper. He then adds a little fuel to the rumor fire:

> A storage system meeting some of the specifications is said to be under development in IBM. It is a three-inch wide multi-tape loop. In the absence of specific information, I can only speculate that the system will aim to produce automated tape libraries having up to, say [100 billion] bit storage capacity. Tape loops can be sotred in chambers, accessed pneumatically, then rotated at high speed for writing, reading, and erasing. Reliability problems associated with the extremely large number of rotational cycles requires, i.e., tape edge damage, and splices (if used) will have to be solved. If produced, and reliability is demonstrated, this large storage system would impact the lower bound of the ultra-large storage market. It remains to be seen whether achievement of the projected performance is possible with a reliable system.

No comment! This is the first time EDP/IR has seen anything about the oft-rumored Project Commanche in published collection of technical papers.

In addition to the Ampex TBM and whatever IBM has on the drawing boards, two other mass archival storage systems are around:

- Grumman Data Systems' MASSTAPE -- scheduled for first delivery near the end of this year -- is a high-performance, on-line modular system with capacities ranging up to the 100-billion bit range (compared with Ampex' trillion);

- Precision Instruments' Unicom system uses a laser to accumulate data in an extremely dense format. Under trial at the Ames Research Center, it does not allow data to be erased, although data can be added in spaces not previously written upon.

Other technologies are not considered (by Gross) as competitors during the next ten years. Electron beam systems, he says, are not developed because of beam control problems. And holographic storage systems, "while practical for fiche-like permanent storage systems, are limited . . . within this time period. The erasable holographic storage system appears to have the greatest potential for the second 10-year period."

FJCC -- The coming of age

And so it goes. Plans for the Fall Joint look like a continuation, with papers organized around many of the same topics covered at SJCC. In addition to general sessions on user applications, a special program will cover banking EDP administration and electronic payment systems. It does seem interesting that Afips has almost singled out the industry that is doing the most, on its own, to discuss its use of computers (see below).

BANKS GO HEAVILY INTO COMPUTERS FOR FUNDS TRANSFER, SECURITY, AUTOMATED SERVICES

No major mainframers and very few end-user suppliers exhibited at SJCC. Economy moves? Not really. The show has become vendor oriented, and the major suppliers

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are concentrating their efforts where the equipment buyers are -- industry-oriented shows. A case in point, the get-together of bankers in Miami only two weeks before SJCC, brought out bigger names and almost half as many exhibitors for only 10% the crowd. But the 70 or so exhibitors -- including IBM, Honeywell, NCR, and of course Burroughs -- visited by EDP/IR were enthusiastic about the quality of the 1,500 visiting bankers.

Transfer of funds has become a bigger and bigger banking problem as millions of checks a day must be cleared. So computer industry companies offered several possible solutions, many of them based on transmission; and AT&T and Western Union were also on hand to promote transmission in general as a replacement for mail or hand delivery.

Remote MICR readers for regional data centers were displayed by Honeywell and Lundy. In addition, companies such as IBM, Burroughs, and CDC were showing off terminals for updating passbooks or inquiring into a customer information file. And the Hempstead Bank of Syosset, N.Y. reported on its attempts to completely eliminate checks. A customer ID code and the amount of purchase are entered through merchant terminals. Initial customer reaction has been favorable, and banks also are interested because the same credit card can provide personal loans to customers.

There is still a push for optical character recognition. Burroughs, Lundy, and NCR (with the Lundy system) showed large-scale reader-sorters for credit card documents. And CDC displayed its low-cost (under $2,000 a month) document reader. This 921, according to CDC, makes it easier for keypunch customers to switch over to OCR. In addition, it is expected to deter some of the company's older 915 page reader customers from switching to combination page and document readers being offered as an alternative.

Several banks were promoting their own software for handling credit cards and correspondent banking right alongside independent organizations such as Computer Sciences, Computer Systems & Education, and Florida Software Services.

There is strong interest in services by banks, and this showed up in the large attendance at two sessions: "Considerations in Forming a Holding Company DP Subsidiary" and "Trends in Automated Customer Services." At the latter session, the ABA presented preliminary findings from its recent mail survey. The study showed that 85% of banks with on-premise computers are offering or planning some form of computer service, and only payroll has diminished slightly.

TRENDS IN SERVICE OFFERINGS BY BANKS WITH ON-SITE COMPUTERS

	Percent of Banks Offering Services		
	1966	1969	1972
Payroll	60%	92%	87%
Account Reconciliation	46	68	75
Correspondent Services	34	43	69
Accounts Receivable	24	38	40

With the increased interest in this area by banks and service companies alike, the International Data Corporation, publisher of EDP/IR, is currently undertaking a major study of the past, present, and expected activities of banks in the services industry.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

COMPUCARE INC.	Compucare, Inc., 8550 West Bryn Mawr Ave., Chicago, Ill., a consultant and computer service company for the health care field, filed 250,000 common shares at $7 each (max.) on April 10, for working capital and other corporate purposes. S.D. Lunt & Co., New York, N.Y. is the underwriter.
COMPUTER HARDWARE CONSULTANTS & SERVICES, INC.	Computer Hardware Consultants & Services, Inc., 1409 Easton Rd., Warrington, Pa. 18976, a company in the add-on computer memory business, on April 21 filed for 382,860 shares of common stock, of which 255,000 are to be offered for public sale by the company and 93,060 (being outstanding) by the holders thereof. Proceeds from the offering, at $9.25 per share max., will be used to develop a field service and maintenance organization and for other corporate purposes. Underwriters are headed by D.H. Blair Securities Corp., 437 Madison Ave., New York 10022.
DORSET COMPUTYPE CORP.	Dorset Computype Corp., 347 West John St., Hicksville, N.Y., a specialist in computerized printing of financial material, filed on March 15 for 100,000 common shares at a price of $2 per share. Proceeds of the offering are for expansion and working capital, and the underwriter is Seed Capital Corp., New York, N.Y.
INTEL CORP.	Intel Corp., 3065 Bowers Ave., Santa Clara, Calif., a manufacturer of semiconductor memory components, filed to register 37,981 shares of common stock to be offered for public sale at $22.63 per share maximum price.
ITEK CORP.	Itek Corp., 10 Maguire Road, Lexington, Mass., manufacturer of electro-optical equipment and printing systems, filed 66,815 shares of outstanding common stock on April 10 to be offered from time to time with the price by amendment but at a maximum per share of $71.875. Proceeds will be used for selling stockholders and an underwriter is yet to be named.
MEMOREX CORP.	Memorex Corp., San Tomas at Central Expressway, Santa Clara, Cal., filed to register 16,000 shares of common stock of which 15,000 may be issued to stock optionees and shareholders of Midwest Systems Corp., a majority owned subsidiary, and 1,000 to shareholders of MRX Sales and Service Corp., also a subsidiary.
SCAN SYSTEMS INC.	Scan Systems Inc., Holiday Office Center, 1325 North Atlantic Ave., Cocoa Beach, Fla., a manufacturer of automated material handling equipment, filed on April 4 for 225,000 shares of common and 75,000 common purchase warrants to be offered in units of three shares and one warrant at $8 per unit. Proceeds to be used for working capital with the underwriter named as M.A. Safir & Co., Inc., New York, N.Y.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" JUNE 16,1972 • VOL.7,NO.15 P.J.McGOVERN,EDITOR

VIRTUAL MEMORY, VARIABLE MICROLOGIC, MULTIPROGRAMMING BRING LARGE SYSTEM CAPABILITY TO NEW BURROUGHS SMALL COMPUTER FAMILY

Procrustean -- marked by complete disregard of individual differences or special circumstances with arbitrary, often ruthless or violent forcing into conformity with or subservience to something . . . such as a system, policy, or doctrine.

In "a departure from procrustean design techniques," as a company spokesman described it, Burroughs introduced some radically new data processing concepts with its B 1700 series of small-scale data processing systems. All the buzz words were there, but the message was clear: Burroughs is going after the small computer marketplace.

The announcement sessions and equipment demonstrations in Detroit and London were full of descriptors that made technical reporters sit up and take note:

- "Fourth generation design: Combines microprogramming with the latest circuitry design, large scale integrated circuit (LSI) memory and medium scale integrated circuit (MSI) logic.

- "Variable micrologic: Alters the processor's logical operation dynamically to optimize performance with a variety of program languages, including those of other computers for which interpreters are written.

- "Master Control Program: Assigns memory, manages input/output functions, communicates with the operator, logs system use, loads programs, maintains a library of all files, and supervises other functions, all of which contribute to simpler programming, ease of system operation, and maximizing of throughput.

- Bit addressability: Eliminates the need for predefined data structures such as words or bytes. This permits every unit of memory in B 1700 Systems to be utilized by the user's data and programs."

But the how of the matter isn't really important to the typical user Burroughs is out to sell. Naturally, he will be pleased "that, for the first time, he can

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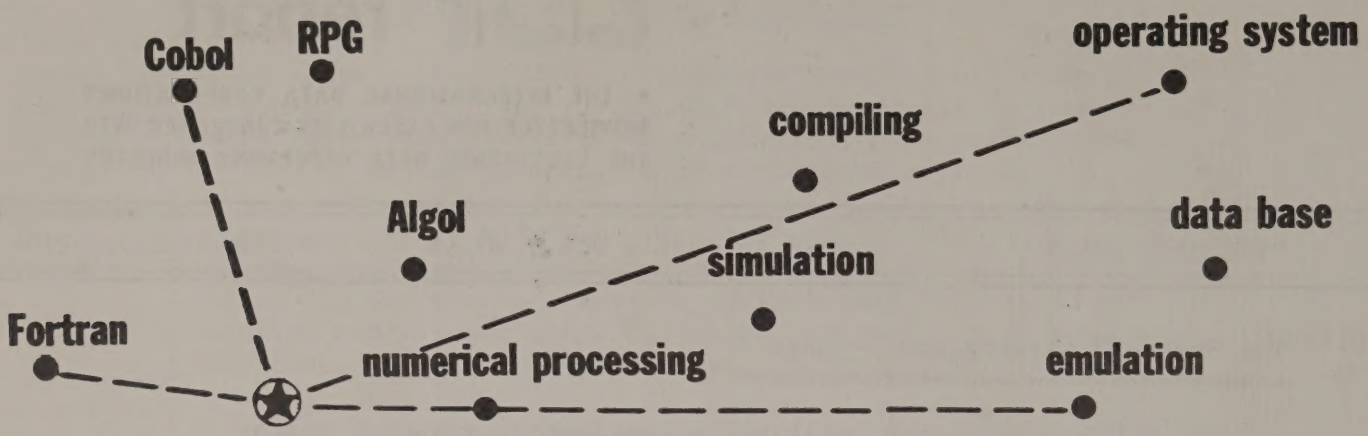

REGULAR MACHINE DESIGN, portrayed above, is arbitrary. Software must compensate for job requirements, so some tasks will be performed poorly at best.

benefit from the sophisticated techniques utilized in larger scale systems . . . But he is probably much more pleased there is a business management system ready to fit his application, or that his System/3 card deck will load and run -- from 1.1 to 4.8 times as rapidly, Burroughs says -- on a B 1700.

Yes, Virginia . . .

Burroughs singled out a sizeable marketplace in describing potential customers for the new computer family. With the three models of the B 1700 it announced, Burroughs will be going after:

- First-time computer users, from its own accounting machine base or from any other source.
- Current small system users who "want better results" and a clear upward growth path.
- Distributed or remote processing applications.

A quite flexible design will allow this. The MCP Operating System handles problem-oriented languages such as Cobol, RPG, Fortran, and Basic . . . and all at the computer's maximum efficiency. There's a complete line of 80- and 96-column card equipment (much of the latter built by or under license from Decision Data), including a buffered data recorder and a multipurpose card unit that doubles as an off-line sorter. Communications features include synchronous and asynchronous line adapters for transmission rates of up to 9600 bits per second.

Three models . . . so far

In announcing the B 1700 family, Burroughs introduced three models -- the 1712, 1714, and 1726 -- that had been leaked fairly widely. One document that talked about these models, by number, also indicated that a 1736 and 1746 were in the works. Burroughs certainly confirmed that more members of this distinct family will eventually be introduced. And personnel on the design team, in private conversations with EDP Industry Report, indicated a strong sense of allegiance to the product. "This is the start of Burroughs' product line of the 1970s" was the tone of several conversations.

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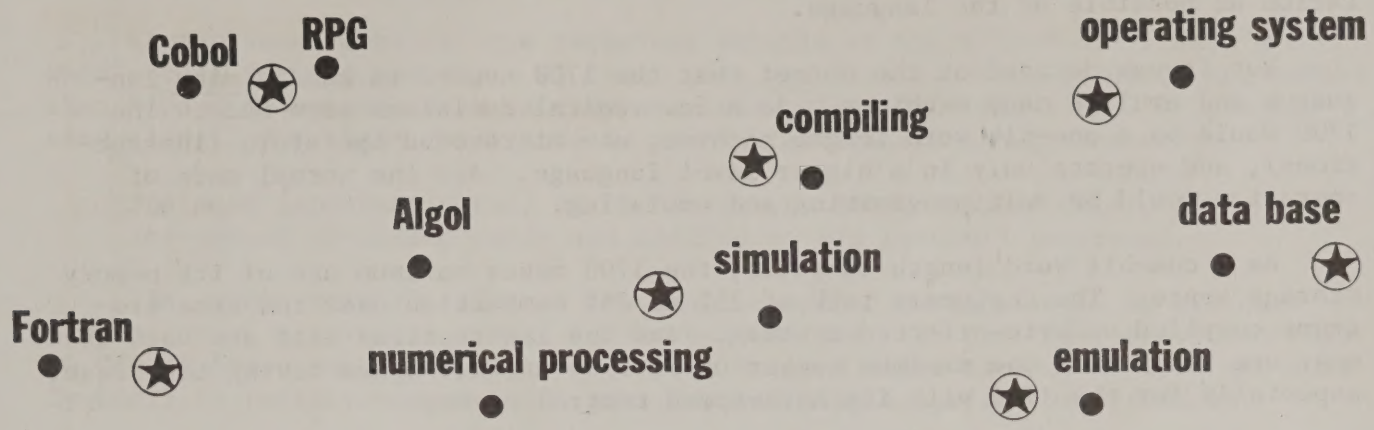

B1700 MACHINE DESIGN is flexible. Through variable micrologic, the computer acts like many different machines, each designed for a specific language.

The three B 1700 announced systems differ principally in central processor speeds, main memory capacity, use of control memory, and the ability to utilize data communications and various peripheral. Here's how they stack up:

- B 1712 -- Processor cycle time of 500 nanoseconds; 16K to 40K bytes of main memory. Purchase prices range from $70,000 to $120,000, with comparable monthly leases from $1,500 to $2,800.

- B 1714 -- Processor cycle time of 250 nanoseconds; 16K to 65K bytes of main memory; communications available. Purchase prices range from $75,000 to $200,000, with monthly leases from $1,600 to $4,500.

- B 1726 -- Processor cycle time of 167 nanoseconds; 24K to 98K bytes of main memory with a 222 nanosecond/byte read time, as with the other models; bipolar control memory of 2K or 4K bytes with an effective read cycle time of 83.5 nanoseconds per byte; communications. Purchase prices range from $135,000 to $475,000, with comparable leases from $3,000 to $10,000 a month.

All the processors can have up to 8 individual controls for input/output, and are fully buffered, allowing processor and peripheral units to run independently and at full rated speeds. The console of each processor has a built-in cassette tape reader that is used for initial loading of system software, and for entering diagnostic software for fast processor maintenance.

How it works

Key to the 1700s flexibility is its design.

As in the case of the B 5500 and the B 3500, the plan behind the B 1700 family was based on software considerations. But this time there was a slight difference, and the charts on these two pages suggest what was done.

Most computers are designed by hardware people to some arbitrary set of specifications. In Burroughs case, major computer models have always been designed with a certain language in mind . . . Algol in the case of the 5500 and Cobol for the 3500. In mathematical terms, these machines "mapped" well into

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the predetermined language; the hardware instructions were as close a representation as possible of the language.

But it was decided at the outset that the 1700 needed to handle many languages and emulate many machines. So a few radical decisions were made. The 1700 would be a one-bit word length machine, use microcoded operators (instructions), and operate only in a higher level language. And the normal mode of operation would be multiprogramming and emulating.

As a one-bit word length computer, the 1700 makes maximum use of its memory storage space. The designers talk of 25% to 75% compaction over the same programs compiled on byte-oriented systems. And the instructions that are used the most are coded with the minimum number of bits -- another space saving technique, especially for the 1726 with its high-speed control memory.

There are few basic hardwired instructions in the 1700; most of them are in microcode. Thus, after several teams of designers were told to come up with the best machine design for a particular language -- including the system or "S" language for the 1700 -- this machine was "built" for the 1700. In other words, it was implemented through microcode.

When a Fortran program runs, the 1700 looks like a computer designed for Fortran; and the same is true so far for Cobol, RPG, and Basic. Obviously, other languages can be implemented. At present, Burroughs does not allow customers access to the microcode, delivering what is needed -- at a price -- on a cassette, much like IBM provides special controllers on its "floppy disk."

This all requires virtual memory, since the MCP contains some 18,000 statements that have to be available when needed. Therefore, a disk drive must be associated with the system. Burroughs offers a removable disk cartridge file, similar to that used by the System/3, in four sizes ranging from 2.3 million to 91.2 million bytes. For the 1726, the company also offers a 2314 like dual disk pack drive with 95.5 million byte formatted capacity, and two head-per-track "memory banks" that can provide a total capacity of 70 million bytes.

Pattern for success

Burroughs will be marketing the 1700 in an "unbundled" environment, just as it has been offering its "L" series that it calls business minicomputers. And it expects the business application program packages to be popular. It announced packages for banking (along with a new line of MICR equipment), hospital administration, production control, wholesaling, and distribution.

The company points to success. With the "L" series machines, Burroughs has marketed over 30,000 licenses, or software packages. This shows that a) the idea will work with small users who can't afford large programming staffs and b) that there is a sizable base of customers that eventually can be upgraded to the new computer system.

And at the announcement of the B 1700, Burroughs disclosed that it has an order for 74 B 1700 computers -- with a sales value of approximately $8 million -- from the Yugoslav state bank. The computers will be installed at the bank's headquarters in Belgrade and in branches throughout the country, starting late this year. They will handle inter-company monetary transfers, serving much the same function as the Federal Reserve banks in the United States.

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Accepting the inevitable -- System/3

As mentioned earlier, the technical details of the B 1700 are fine, "gee whiz" stuff for the purists. At least they are finally being pointed out, rather than hidden or unrecognized as they were when the B 5000 and B 5500 originally came along. But their importance is merely incidental, though necessary:

The most important detail of the Burroughs 1700 computer family is its use of 96-column cards and ability to run System/3 programs.

IBM, with System/3, defined the small computer marketplace. At his company's annual meeting in April, T. Vincent Learson, IBM chairman, disclosed that 10,000 of these small computers have been shipped since January of 1970 and that System/3 is rapidly becoming the most popular single system ever produced.

At the time of System/3's announcement, EDP/IR forecast a potential market of 26,000 to 28,000 of these small computers . . . and was considered highly optimistic. Today, the International Data Corporation, publisher of EDP/IR, forecasts that the number of S/3 computers installed worldwide should hit the 16,000-to-17,000 level by yearend 1972, that another 10,000 will likely be shipped during 1973, and that the eventual count of these computers may well exceed 30,000.

This forecast was made before Burroughs announced the 1700 family, and probably should be bumped even more. It certainly is still considered conservative for machines of the System/3 class.

As 1971 ended, almost one out of every ten general-purpose computers in the United States was an IBM System/3. And at production levels even close to those implied in the above forecast, the distribution will be one out of five just a year from now, at mid-1973. No wonder Burroughs swallowed a pill, as it were, and accepted the new small-computer standard, the 96-column card.

What it means

The numbers given above are big, almost unreal. But this isn't just a numbers game . . . not a hardware manufacturing race like the one many minicomputer manufacturers seem to be running. These numbers describe a new rental force in the computer industry . . . new sources of software and service revenue as well.

Not too long ago, there was trade talk that IBM might spin off its System/3 operation as a separate subsidiary. For the time being, this scheme reportedly has been shelved, at Justice Department request. But what would have resulted is still of interest.

IDC calculated that the System/3 operation would have revenues of about $330 million in 1972, growing to the $550 million level for 1973. Of course, IBM still has this revenue base, and it's a growing portion of the company's total. Small, in IBM terminology; not so small to Burroughs, with $422 million in revenues from its Business Machines Group last year. And growing.

And large. Burroughs may be looking to convert some System/3 users to its 1700, and probably will. But there is untapped potential among the non-computer business concerns; IBM still has some weak spots when the marketplace is examined on an industry-by-industry basis.

(Continued on Page 8)

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GENERAL PURPOSE COMPUTER CENSUS

Counts in the General Purpose Digital Computer (Group A) Census, shown below, are based on the best information available to the International Data Corporation, but are estimates. Computer manufacturers, as a rule, do not directly supply this type of information, and it is only through the use of IDC's extensive data files and other information sources that such estimates are possible. The computers included in Group A comprise the bulk of digital computers (by value) in operation. They are byte or character oriented -- with the exception of large-scale scientific machines -- and are primarily programmed with higher-level languages. In addition to this Census, EDP/IR publishes a Dedicated Application Digital Computer (Group B) Census that includes minicomputers and specialized-purpose machines.

AS OF APRIL 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Burroughs	205	$ 4,600	1/54	1	5	6	X
	220	$ 14,000	1/58	3	2	5	X
	B-100 Series	$ 3,300	8/64	7	0	7	X
	B-200 Series	$ 6,500	11/61	208	131	339	X
	B-300 Series	$ 8,000	7/65	505	97	602	X
	B-500	$ 4,000	11/68	550	500	1050	110
	B-2500	$ 6,800	2/67	280	130	410	35
	B-3500	$ 15,500	5/67	550	315	865	70
	B-4500	$ 29,000	11/71	12	0	12	40
	B-4700	$ 33,000	10/71	6	0	6	20
	B-5500	$ 35,000	3/63	135	43	178	X
	B-5700	$ 28,500	12/70	10	3	13	7
	B-65/6700	$ 68,000	11/69	36	33	69	15
	B-7700	$120,000	2/72	-	-	-	6
	Subtotals			2303	1259	3562	303
Control Data Corp.	G-20	$ 19,600	4/61	5	8	13	X
	1604/A/B	$ 42,000	1/60	23	4	27	X
	31/3150	$ 11,000	12/64	76	40	116	X
	3170	$ 17,500	12/70	26	11	37	10
	3200	$ 14,700	5/64	50	39	89	X
	3300	$ 21,500	9/65	110	99	209	X
	3400	$ 23,700	11/64	4	9	13	X
	3500	$ 26,000	1/69	10	12	22	3
	3600	$ 48,000	6/63	20	19	39	X
	3800	$ 53,000	12/65	15	5	20	X
	6200	$ 39,000	11/70	2	2	4	X
	Cyber-72	$ 32,900	10/71	3	1	4	5
	6400	$ 52,000	5/66	59	40	99	X
	Cyber-73	$ 45,000	3/72	1	0	1	5
	6500	$ 68,000	12/67	15	5	20	X
	6600	$115,000	8/64	61	37	98	2
	Cyber-74	$105,000	3/72	1	0	1	6
	6700	$125,000	7/70	4	1	5	1
	7600	$165,000	1/69	14	2	16	X
	Cyber-76	$165,000	3/72	1	0	1	4
	Star-100	$250,000	9/72	-	-	-	2
	Subtotals			500	334	834	38
Digital Equipment Corp.	PDP-6	$ 10,000	10/64	16	9	25	X
	1040/1050	$ 13,300	10/67-12/71	148	61	209	13
	1055	$ 25,000	12/71	5	0	5	10
	1070/1077	$ 34,600	6/72- 9/72	-	-	-	6
	Subtotals			169	70	239	29
Friden	System 10	$ 2,500	10/70	240	75	315	460
Honeywell Information Systems	Gamma 10	$ 1,950	7/64	0	1140	1140	X
	G-5X Series	$ 1,400	1/66	125	1805	1930	75
	G-105	$ 1,350	3/69	63	97	160	24
	G-115	$ 2,500	4/66	260	1200	1460	X
	G-120	$ 4,500	1/70	28	230	258	45
	G-130	$ 4,400	10/69	3	100	103	20
	G-205/215	$ 4,500	9/63- 6/64	17	0	17	X
	G-210	$ 16,000	3/60	18	0	18	X
	G-225/255	$ 13,000	4/61-10/67	153	22	175	X
	G-235/265	$ 17,000	4/64-10/65	69	29	98	X
	G-245/275	$ 18,000	2/68-11/69	6	5	11	2
	G-405/410	$ 9,000	2/68-11/69	36	12	48	3
	G-415/420	$ 14,000	5/64- 6/67	195	260	455	X
	G-425/430	$ 17,000	6/64- 6/69	82	102	184	5
	G-435/440	$ 22,000	9/65- 7/69	48	40	88	6
	615	$ 55,000	6/69	20	18	38	X
	625	$ 65,000	4/65	1	4	5	X
	635	$ 80,000	5/65	63	15	78	X
	645	$120,000	7/66	3	0	3	X
	6030/6040	$ 25,000	6/71- 3/72	10	11	21	52
	6050/6060	$ 46,500	7/71- 3/72	8	5	13	32
	6070/6080	$ 61,500	7/71- 3/72	5	3	8	20
	G-Subtotal			1213	5098	6311	284
	H-105	$ 2,100	11/71	80	10	90	130
	H-110	$ 3,200	9/68	190	220	410	X
	H-115	$ 5,300	3/70	700	165	865	210
	H-120	$ 5,000	1/66	740	300	1040	X
	H-125	$ 7,400	12/67	145	350	495	X
	H-200	$ 7,600	3/64	705	335	1040	X
	H-2040	$ 7,500	4/72	-	-	-	74
	H-1015	$ 11,800	4/71	75	32	107	60
	H-2050	$ 12,000	4/72	-	-	-	32
	H-12/1250	$ 12,500	2/66- 8/68	410	190	600	X
	H-2015	$ 12,800	2/71	105	22	127	70
	H-2060	$ 16,200	4/72	-	-	-	26
	H-2200	$ 19,600	1/66	127	69	196	X
	H-2070	$ 23,000	5/72	-	-	-	13
	H-3200	$ 24,000	2/70	53	25	78	14
	H-4200	$ 31,000	9/68	26	6	32	X
	H-2088	$ 44,000	4/72	-	-	-	7
	H-8200	$ 73,000	2/69	19	3	22	3
	H-4/1400	$ 13,200	12/61- 1/64	39	36	75	X
	H-800	$ 28,500	12/60	54	13	67	X
	H-1800	$ 46,000	7/64	12	3	15	X
	H-Subtotal			3480	1779	5259	639
	HIS-Subtotal			4693	6877	11,570	923

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AS OF APRIL 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
IBM	System-3/6	$ 1,400	12/70	2,620	630	3,250	]
	3/10	$ 1,700	1/70	5,450	1,300	6,750	] 6,000
	360/20	$ 4,200	12/65	8,200	5,850	14,050	X
	360/22	$ 5,600	7/71	560	40	600	400
	360/25	$ 8,000	10/68	2,380	1,300	3,680	150
	360/30	$ 11,000	6/65	5,720	3,100	8,820	X
	370/135	$ 14,000	5/72	-	-	-	2,500
	360/40	$ 20,500	5/65	3,080	2,070	5,150	X
	370/145	$ 26,500	7/71	600	243	843	1,500
	360/44	$ 13,800	7/66	98	101	199	X
	360/50	$ 36,000	8/65	1,120	645	1,765	X
	370/155	$ 50,000	2/71	700	280	980	550
	360/65	$ 69,000	11/65	595	235	830	X
	370/165	$ 87,000	6/71	121	56	177	220
	360/67	$138,000	6/66	66	11	77	X
	360/75	$ 91,000	1/66	53	25	78	X
	360/85	$155,000	10/69	22	9	31	X
	360/9X	$150,000	11/67	15	3	18	X
	360/195	$210,000	3/71	5	1	6	4
	370/195	$215,000	5/73	-	-	-	6
	1130	$ 2,200	2/66	4,080	2,100	6,180	X
	305	$ 3,600	12/57	1	17	18	X
	650	$ 4,800	12/54	4	31	35	X
	1401	$ 6,200	9/60	1,540	1,720	3,260	X
	1401-G	$ 2,300	5/64	255	105	360	X
	1401-H	$ 1,300	6/67	145	34	179	X
	1410	$ 17,000	11/61	142	88	230	X
	1440	$ 4,100	4/63	625	550	1,175	X
	1460	$ 9,800	10/63	67	52	119	X
	1620	$ 4,000	9/60	410	265	675	X
	7010	$ 26,000	10/63	21	12	33	X
	7030	$160,000	5/61	3	1	4	X
	704	$ 32,000	12/55	2	4	6	X
	7040	$ 25,000	6/63	19	22	41	X
	7044	$ 36,500	6/63	15	17	32	X
	705	$ 38,000	1/56	10	5	15	X
	7070/74	$ 27,000	3/60- 2/61	131	44	175	X
	7080	$ 60,000	8/61	54	1	55	X
	7090	$ 63,500	8/60	23	19	42	X
	7094	$ 73,400	9/62	66	9	75	X
	7094-II	$ 79,400	4/64	16	0	16	X
	Subtotals			39,034	20,995	60,029	11,330
NCR	Century-50	$ 1,650	2/71	245	15	260	135
	Century-100	$ 2,600	9/68	1600	565	2165	170
	Century-101	$ 2,750	10/72	-	-	-	NA
	Century-200	$ 7,700	9/69	510	240	750	130
	Century-300	$ 20,000	2/72	1	2	3	44
	304	$ 10,000	1/60	12	2	14	X
	310	$ 1,000	5/61	10	3	13	X
	315	$ 7,000	5/62	330	365	695	X
	315-RMC	$ 9,000	9/65	120	50	170	X
	390	$ 800	5/61	240	370	610	X
	500	$ 1,000	10/65	940	1700	2640	X
	Subtotals			4008	3312	7320	479
Philco	1000	$ 7,000	6/63	23	1	24	X
	210/211	$ 40,000	10/58	12	1	13	X
	212	$ 52,000	1/63	11	1	12	X
Standard Computer Corp.	IC-4000	$ 9,000	9/68	10	0	10	X
	IC-6000	$ 16,000	5/67	9	0	9	X
	IC-7000	$ 17,000	6/69	18	0	18	X
Univac	I/II	$ 25,000	3/51-11/57	3	2	5	X
	III	$ 25,400	8/62	43	45	88	X
	SS-80/90	$ 8,000	8/58	50	64	114	X
	418-I/II	$ 13,700	6/63	84	80	164	X
	418-III	$ 19,600	7/69	38	53	91	10
	491/492	$ 27,000	12/61	16	13	29	X
	494	$ 41,400	2/66	56	42	98	5
	1004	$ 1,900	2/63	1050	1200	2250	X
	1005	$ 2,550	4/66	830	190	1020	X
	1050	$ 8,800	9/63	195	180	375	X
	1103/5	$ 35,000	12/50	3	2	5	X
	1106	$ 40,000	12/69	41	55	96	25
	1107	$ 57,000	10/62	13	17	30	X
	1108	$ 68,000	9/65	150	85	235	5
	1110	$ 79,000	5/72	-	-	-	24
	9200	$ 1,700	6/67	1550	780	2330	125
	9300	$ 4,000	9/67	850	860	1710	135
	9400	$ 10,000	5/69	200	190	390	70
	9700	$ 21,000	8/72	-	-	-	25
	LARC	$135,000	5/60	1	0	1	X
	Subtotals			5173	3858	9031	424
	301	$ 6,600	10/60	215	17	232	X
	501	$ 16,100	6/59	30	2	32	X
	601	$ 40,900	11/62	4	0	4	X
	3301	$ 22,700	7/64	71	0	71	X
	Spectra 70/15	$ 4,000	9/65	23	0	23	X
	Spectra 70/25	$ 7,000	9/65	3	3	6	X
	Spectra 70/35	$ 9,100	1/67	147	6	153	X
	Spectra 70/45	$ 22,100	11/65	350	27	377	X
	Spectra 70/46	$ 37,400	11/68	50	4	54	X
	Spectra 70/55	$ 34,900	11/66	17	2	19	X
	Spectra 70/60	$ 33,400	9/70	14	0	14	X
	Spectra 70/61	$ 47,200	3/71	11	0	11	X
	Spectra 1600	$ 3,600	1/69	53	0	53	6
	Series 70/2	$ 15,400	7/71	55	0	55	55
	Series 70/3	$ 18,900	10/71	6	0	6	11
	Series 70/6	$ 29,300	10/71	7	0	7	14
	Series 70/7	$ 36,300	10/71	8	0	8	4
	Subtotals			1064	61	1125	90
	Totals			6237	3919	10,156	514
XDS	Sigma-5	$ 11,500	8/67	136	36	172	16
	Sigma-6	$ 20,000	11/70	16	3	19	6
	Sigma-6E	$ 6,100	-	-	-	-	NA
	Sigma-7	$ 24,000	12/66	89	23	112	7
	Sigma-8	$ 19,000	9/71	6	0	6	6
	Sigma-9	$ 44,000	11/71	4	3	7	6
	940	$ 24,000	4/66	68	3	71	X
	9300	$ 8,500	11/64	26	6	32	X
	Subtotals			345	74	419	41
	TOTALS			57,612	36,918	94,530	14,117

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DISTRIBUTION OF SYSTEM/3 COMPUTERS IN THE UNITED STATES
(Yearend 1971, Expressed as Percent of All General-Purpose Computers)

SIC	Description	%	SIC	Description	%
0X-1X	Mining & Construction	40%	91	Federal Government	0%
19&3X	Other Manufacturing	24%	60	Banking	2%
7X&8X	Other Services	20%	82	Education	3%
50	Wholesale	19%	63	Insurance	4%
35	Non-Elec. Machinery Mnfg.	17%	49	Electric & Gas Util.	5%

From an analysis of the U.S. Computer Installation Data File it maintains, IDC research showed that, on average, System/3 represented 9.4% of the total number of Group A or General Purpose computers in the country at yearend 1971, and already has risen to 14% of the total. But this distribution varies considerably by industry, as the table above shows.

And these are just sample SIC groups. But the message is clear. In some of the areas where IBM is weakest with System/3, Burroughs has strength and/or a good chance with its large marketing organization. It is mounting an initial thrust on the banking industry, as would be expected.

The introduction of the B 1700, Burroughs says, brings to banks using small computers the same opportunity for management reporting and control that is available to larger system users. Its Bank Management System includes five complete application systems -- demand deposit accounting, savings accounting, installment loan accounting, general ledger accounting, and proof and transit processing. The systems generate some 25 reports and "include some 75 programs that reduce a bank's program costs to a small fraction of what the bank would pay for developing and maintaining its own programming."

And packages -- indeed entire application systems -- are in the works for many other industries, many of them adapted from the extensive effort already devoted to the "L" series of programmable calculators.

The marketplace for small computers is vast. And it has been cracked wide open by IBM. So there is no reason to doubt that Burroughs can sell and ship the 40 or 50 systems (2 a day) it is presently capable of manufacturing each month. IBM is churning out System/3s at the rate of 35 a day!

Before the B 1700 can be appropriately compared with a competitive computer, it needs to be operating several jobs in a stream. The computer is designed for multiprogramming -- in one language or several -- and shows up best when it is running several jobs at once. In such an environment, the 1700 takes advantage of all its assets -- memory compaction, multiprogramming, simultaneity of processing and input/output operations.

At the introduction in Detroit, the 1700's designer was talking about running a System/3 program on a 1700 . . . telling how it ran faster and needed to execute far fewer instructions. He suddenly turned his head to one side, looked off over the heads of the reporters in the audience, and reflected on the 115% efficiency factor he had just described: "That's kinda neat." And so it is. The B 1700 is an innovative computer family that will bear careful watching.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" JUNE 30,1972 • VOL.7,NO.16 P.J.McGOVERN,EDITOR

Management attitude study

MAJOR USERS PLAN NEW APPLICATIONS, MOVE TOWARD REMOTE COMPUTING; SALARY INCREASES SLACK OFF AS HARDWARE SPENDING INCREASES 18%

In studies of both top management attitude and user budget expectations, the International Data Corporation, publisher of EDP Industry Report, has found that users are definitely expressing renewed interest in data processing.

Gone are the days of simply holding on and trying to squeeze every ounce of performance and profitability from EDP operations. But lessons have been learned. In retrospect, reports from major users indicate, the constraints imposed by the weak economy were probably the best thing that has happened for the computer user in many years.

Prior to the recession of 1970-1971, many computer installations had merely been rolling along . . . adding applications to existing systems . . . ordering more equipment on an "as needed" basis . . . burying inefficiency under a cloak of redundancy. This had worked during the great boom of the computer mystique during the 1960s; when all was well, little attention was given to the optimization of existing systems.

Now, this situation seems to have changed. After a year or two of reflection -- and with more cost/effective equipment now available -- the data processing community is much more sophisticated. A summary of the management attitudes found by IDC indicates:

- Dissatisfaction with overall DP performance. Over 95% of the professional computer users interviewed (see page 3) described situations that were in the process of being remedied.

- Realistic new applications in the works. Dreams of total management information systems are still just that -- items in a long-range plan at best. But new types of applications are about to be implemented.

- Desire for more management control of EDP. To this end, centralization plans are being implemented, and user departments are being allocated their fair share of costs. Management wants to see its DP departments operating on a profitable basis.

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In this realistic reappraisal of data processing, top management indicated at least one remaining blind spot. The availability of independent peripheral equipment was not a widely understood alternative. But in general, EDP executives are once again making plans to implement more functions; and this time around, they are using more precise feasibility data and clearer planning procedures than were understood or available in the 1960s.

The things that "bug" management

The dissatisfaction among the executives interviewed by IDC focused squarely on applications development and implementation. Specific complaints uncovered:

- Implementation of new applications is never on schedule. Programs always took longer than planned; projects inevitably were stretched out. A key factor influencing this was personnel turnover, since most delays could be traced to the replacement of a key project team member with someone unfamiliar with the original concept. (Ironically, new applications were shelved during the recent recession -- a time when turnover was at the lowest level in recent history.)

- Somewhat related to the above, the costs of implementing a new application are consistently underestimated, if any precise attempt at estimation is done in the first place.

- Once implemented, applications never seemed to perform as expected. Invariably, certain necessary procedures had not been included, or basic output had never been adequately specified. In general, communication between EDP and user department is an acknowledged problem.

Executives continue to believe in the value of EDP, however, so are opting for more direct executive control in the future. The single most important corrective action being taken is to form steering committees to coordinate and review new applications. This had the immediate result of postponing new applications development in major companies, but in the long run will lead to the implementation of new applications.

The steering committees will establish goals and objectives at the outset of any new project, then fully document the decisions, cost estimates, and benefits that are expected. In addition to bringing the EDP function under management control, the committee approach will assure communication between EDP and the user department, ensuring that all parties to an application fully understand what is to be done.

MIS -- but "I" means Inquiry

One of the most popular of new applications being planned is a system that gives operations managers on-line inquiry into specific master files. Thus, the inventory manager will be able to check the inventory status of stocked items, the personnel manager will be able to determine the data of an employee's last salary increase merely by operating a simple terminal.

These Management Inquiry Systems are not to be confused with the nebulous Management Information Systems, subject of past speculation and future plans, but not available today. This implied integration of various companywide data bases into one huge file that allows top management to manipulate real informa-

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THE PROFESSIONAL COMPUTER USERS

From its continuing studies of computer user trends and activity, the International Data Corporation, publisher of EDP Industry Report, has learned that spending in the computer industry is concentrated in the hands of just a few large organizations. For example, the top 100 computer using organizations spend over 30% of the mainframe dollars in the United States (see below). And these organizations, as leaders in their respective industry groups, often have even more than their share of buying power in specific market sectors.

The top 500 computer using establishments in the U.S. operate upwards of 15,000 computer systems at 6,500 sites, and represent nearly 60% of the total installed value of general-purpose computers in the country. These same organizations, however, account for well over 80% of the shared-processor data entry systems installed, and account for over 80% of the revenues of remote-batch service vendors. Continuing this type of analysis, it turns out that 10,000 -- or less than half the computer using organizations -- spend over 95% of the total EDP dollars in this country.

It is these professional computer sites that IDC samples for its spending studies. These are the pacemaking organizations where new applications are first implemented and new concepts proven. It is these users who must set the pace if the computer industry is to continue solid growth in the future.

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U.S. COMPUTER CONCENTRATION -- GENERAL-PURPOSE COMPUTERS, YEAREND 1971
(Cumulative Totals by Value of Computer Equipment in Use)

Organizations/ Establishments	% Total (By Number)	Number of Computers	% Total (By Number)	Value ($ Million)	% Total (By Value)
Top 100	0.4 %	7,250	13.2 %	$ 8,400	32.2 %
Top 500	2.1	14,450	26.5	15,430	59.1
Top 10,000	41.6	38,900	71.4	24,650	94.3
Total: 24,000	100.0 %	54,468	100.0 %	26,184	100.0 %

tion in a systems manner is still off in the distant future. Today, companies are beginning to capture operating information on computer master files, but usually don't store that information in a randomly accessible mode. Very seldom is there an on-line updating capability.

Paying a fair share

Work on new applications will begin, whether it means dusting off previously started projects or creating others for which a need had not been recognized. And an important step being taken by major companies is to allocate user departments their fair share of departmental expenses. The costs to be allocated include not only operating costs but development costs as well. The result, once again, will assure that user departments become involved and aware of actual usage. In doing so, unnecessary expenditures will be eliminated and those that are implemented will be planned more carefully than before.

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Strong opinions and blind spots

In its interviews with top management, IDC probed other areas connected with data processing. There are many exceptions to the summaries below, but the interviews showed in general that management is unaware of the independent peripheral alternative . . . thinks facilities management implies loss of control at a time when control is desired . . . but is quite willing to use appropriate software packages. Here's a little more detail:

Facilities management -- Defined as hiring an on-site manager who would assume total EDP responsibility, this approach received an overwhelming "no" vote at the companies interviewed. Management considers its present problems to stem from a loss of control (if they ever had it) and thinks that FM would imply even less control. This attitude, however, does not rule out the use of a competent service for one or two unique data processing requirements. In other words, total facilities management is unacceptable, but a specific turnkey service with adequate safeguards might be received enthusiastically.

Independent peripherals -- Top management was totally unconcerned with the actual hardware operating costs of their EDP departments. This was presumed to be the responsibility of the data processing department, and therefore top management showed no awareness of the independent peripheral alternative. This attitude is unusual in view of the comments on software.

Software purchases -- Much like facilities management, custom software as a concept was not well received . . . problems of specification were mentioned. But management interviewed by IDC was clearly attuned to the possibility of acquiring off-the-shelf software that was clearly documented rather than having the EDP department write a similar package.

Where EDP dollars are spent

The pie chart across the page -- and the table on page 7 -- shows how the user spent his EDP dollars last year, and how this differs from that of the preceeding year and the plans for this year. It should be noticed that these are estimates of actual spending patterns by all end users of computer industry products and services. The estimates include some expenditures that are not directly connected with the general-purpose computer budget in most organizations. Two examples of such items are:

- Minicomputers -- Purchases of minicomputers are not normally a part of a DP manager's budget, but they are included because it is usually the same organization that uses the equipment.

- Computer services -- Many users of computer services are not users of general-purpose computers, but most are -- at least from an organizational standpoint. This spending is included and allocated to give a single picture of user spending for computers or their equivalent.

The pie chart shows, in summary, that U.S. organizations spent $18.6 billion for computer products and services during 1971. Of this total, however, only $10.3 billion went to external sources, the other $8.3 billion being spent in the form of salaries for EDP personnel. These break down roughly, during 1971, about as follows: 10% for supervisory and administrative personnel, 40% for programming, systems analysis and design (and therefore another $3.3 billion

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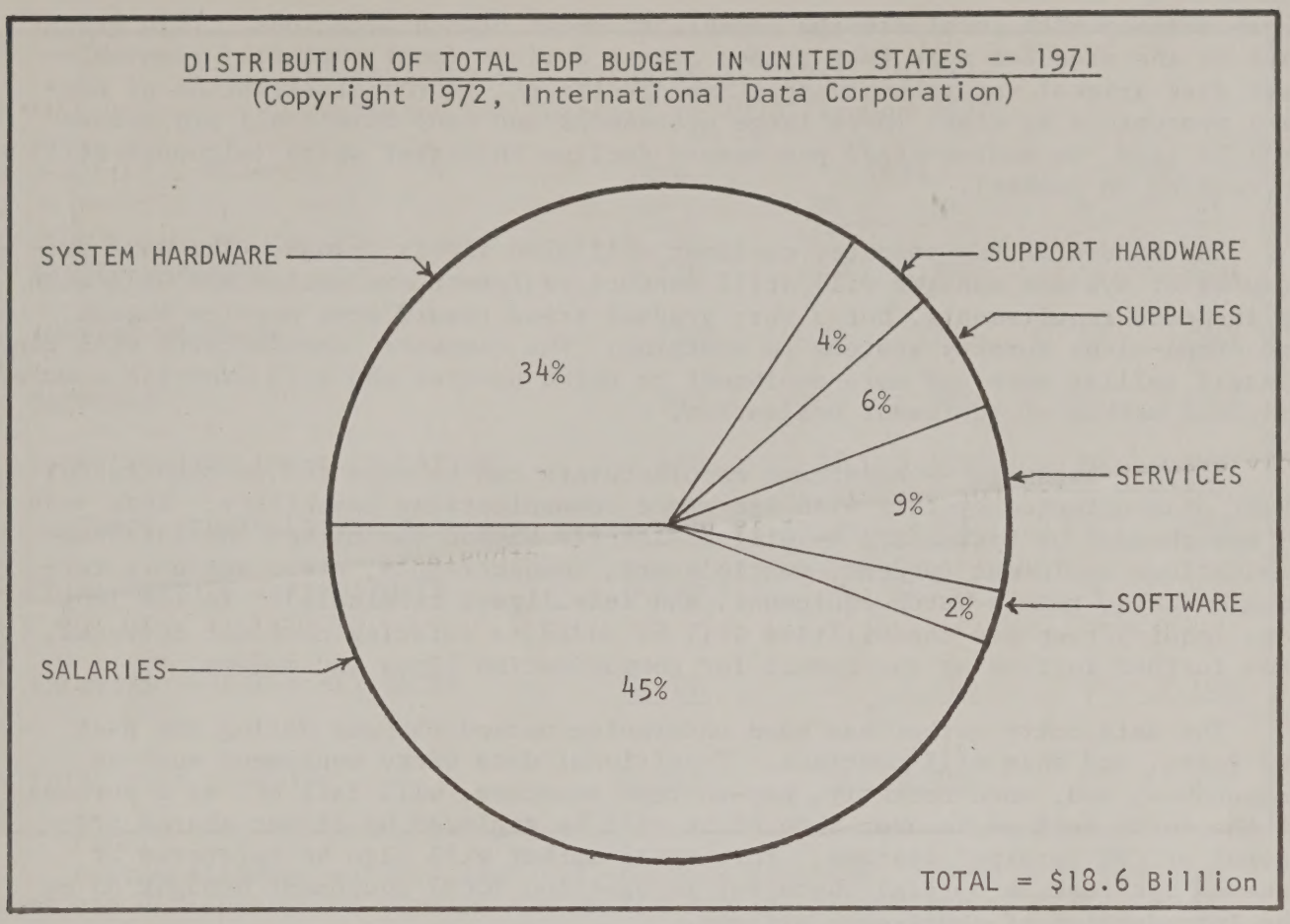

on software, in a different mode of accounting) and 50% on operations. The last figure includes computer operators as well as personnel involved in data entry (keypunch or key-to-tape operators, for example).

The $10.3 billion of outside expenditures is the sum of user spending. All of this shows up somewhere in the revenue statements from companies in the industry . . . and more. This is because some industry participants purchase products and services from each other through OEM or as a leasing company. Thus, if they could all be added up accurately, the revenues to companies in a particular sector will probably be greater than the amount shown here for user spending.

Back to "normal" growth

As the table overleaf shows, user spending this year is running at a rate 13% over that of 1971, heading for the $21 billion level. This is a return to "normal" for the industry, and should bring the associated 15% or so revenue increases to companies in the industry. Here's a brief discussion of the sectors and a condensation of what the IDC user interviews show:

System hardware -- The nature of the installed computer base is undergoing gradual change. As new applications begin to provide line managers with the inquiry capability mentioned above, there is a trend away from the batch operating environment -- with its pages of computer output -- to on-line inquiry stations.

Concurrently, management's quest for control leads to centralization of EDP hardware and its communications linkage to terminals -- especially the remote

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batch variety with local storage capability -- at branch locations. This brings with it the need for more fast random access devices (most typically removable-pack disk drives) and is evolving a "saddle effect" in the distribution of central processors by size. More large processors and many more small processors will be used, as medium-sized processors decline in market share (although still increasing in number).

The nature of the computer customer will also slowly change. The data processing or systems manager will still conduct equipment evaluation and selection or in-house requirements, but a very gradual trend toward more service bureau and stand-alone turnkey systems is emerging. The computer manufacturer will find himself selling more and more equipment to third parties who will exercise a more critical method of equipment evaluation.

Support hardware -- Mainframe manufacturers can be expected to push harder their disk-oriented systems with increased communications capability. This push -- spearheaded by System/370 -- will indirectly expand the market for data communications equipment (modems, multiplexers, concentrators, etc.) and data terminals (CRTs, remote-batch equipment, and intelligent terminals). In the long run, inquiry/response capabilities will be added to existing computer networks, even further increasing the demand for communication lines and modems.

The data entry market has been undergoing marked changes during the past two years, and this will continue. Traditional data entry equipment such as keypunches, and, more recently, key-to-tape encoders, will fall off as a percent of the entry devices in use; some of it will be replaced by either shared processor or CRT terminal systems. This total market will also be bolstered by renewed interest in optical character recognition (OCR) equipment brought on by the introduction of lower-cost systems.

The data entry equipment that is emerging is actually preprocessing systems. As users centralize their data processing activities, they will require more capability and more flexibility in their remote data entry devices. Additionally, once data files are merged into central sites, the need for data input in a preprocessed form becomes more important. Users cannot afford tying up a large processor in the tasks of editing and formatting batched data.

Outside services -- As mentioned earlier, management attitudes are mixed. While continuing to fear a loss of control in EDP operations, many executives acknowledge that turnkey data processing services may be the solution to their problem of poor implementation of planned programs. The biggest obstacle for companies selling turnkey systems is in overcoming the feeling shared by many executives -- that his own company is unique and that, therefore, his data processing applications must reflect this uniqueness. Generalized systems are considered just that -- too general. This, of course, is the attitude in large computer-using organizations where the IDC interviews were concentrated; most turnkey services aim at the small or non-using organizations, so that attitudes of IDC's executive panel certainly don't imply doom for this business sector.

Software -- The packaged software business will continue to thrive . . . a product of unbundling and user dissatisfaction with in-house delays and complications. And users seem to be realistic in what they expect from outside packages. They know they will have to modify packages considerably to conform to the methods of their organization; they are willing to do this whenever the costs are less, and they plan better measurements of these costs.

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COMPUTER USER SPENDING BY EDP ACTIVITY
Estimated and Forecast -- 1970 Through 1972

	1970 $M	1971 %	1971 $M	1972 %	1972 $M
SYSTEM HARDWARE	5,930	7	6,340	18	7,500
SUPPORT HARDWARE	720	6	760	11	850
SUPPLIES	1,020	6	1,080	10	1,180
SERVICES (INCLUDING EDUCATION)	1,430	16	1,660	20	2,000
SOFTWARE (CONTRACT AND PACKAGED)	440	2	450	(10)	400
TOTAL OUTSIDE EXPENDITURES	9,540	8	10,290	16	11,930
SALARIES -- EDP + KEY ENTRY	7,400	12	8,300	10	9,100
TOTAL USER SPENDING	16,940	10	18,590	13	21,030

Custom software suffers from the opposite attitude. Users are convinced they can do sophisticed systems design internally, better and with more control than if they went outside. Talents of in-house systems people have improved over the last few years, and users know this. No longer do concepts such as communications or remote access cause fright. As a result, few outside suppliers have the skills to take projects away from in-house departments.

A lot of details . . . but growth

The expected growth of computer industry segments, of course, isn't so clear as the table above might imply. Computer system rental, for example, will increase only 12% during 1972 while customer purchases spurt up from $1 billion in 1971 to over $1.5 billion this year. Independent peripheral equipment rental revenues will grow by 50% even though shipments will decline or hold level at best. Other segments have similar variations.

But one fact is clear . . . growth. Renewed, orderly growth based on corporate need rather than DP manager whim.

Until a few years ago, the data processing manager got the budget he asked for, and he continually asked for more. But as 1970 rolled in, DP budgets had reached the size of 1%, 2% or more of large corporate budgets, money was restricted, and corporate management was forced to bring DP costs -- along with all other expenses -- under close scrutiny.

This had an observable effect -- it caused most industry progress charts to plateau rather than rise steadily. And it had a more important, long-range effect. Data processing came to the attention of top management. And there it will remain . . . forced to earn its own way, as most proponents think it can.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

CALIFORNIA COMPUTER PRODUCTS, INC.

California Computer Products, Inc. 2411 W. LaPalma Ave., Anaheim, Calif. 92801, a company in the computer peripheral equipment business, filed on May 18 for 396,555 outstanding shares of common stock, which may be offered from time to time by the holders at prices current at time of sale ($20 a share max.).

CAMBRIDGE MEMORIES, INC.

Cambridge Memories, Inc., 285 Newtonville Ave., Newton, Mass. 02160, a company in the memory system business, filed on May 23 for 300,000 shares. Of the proceeds (offering at $15 per share max.), $1.25 million will be used for additional plant, production start-up expenses, and production equipment. Underwriter is Burnham & Co., Inc. 60 Broad St., New York 10004.

COMPUTER OPERATIONS, INC.

Computer Operations, Inc., 10774 Tucker St., Beltsville, Md. 20705, a company engaged in the manufacture and sale of minicomputers and special-purpose computer systems, filed on May 22 for 100,000 shares of common to be offered for public sale at $3.25 per share. Offering made on a best efforts basis by T.H. Lehman & Co., Inc., 120 Wall St., and S.P. Hurwitz & Co., Inc., 26 Broadway, both of New York.

DATA 100 CORPORATION

Data 100 Corporation, 7725 Washington Ave. South, Minneapolis, Minn. 55435, a company that manufacturers and markets medium and high speed remote-batch computer terminals, filed on April 26 for 720,800 shares of common stock, of which 700,000 are to be offered by the company for sale at $14.875 max. and 20,800 by the holders thereof. Underwriters are headed by CBWL-Hayden Stone, Inc., 767 Fifth Avenue, New York 10022.

QUANTOR CORPORATION

Quantor Corporation, 19000 Homestead Rd., Cupertino, Calif. 95014, a company in the microfilm information system business, filed on May 24 for 400,000 shares of common with warrants to purchase 200,000, to be offered for sale in units of two shares and one warrant at $13.25 per unit, max. Underwriters headed by Birr, Wilson & Co., Inc., 155 Sansome St., San Francisco, Calif. 94104.

TERMINAL DATA CORPORATION

Terminal Data Corporation, 16130 Stagg St., Van Nuys, Cal. 91406, a company that manufactures and markets two types of microfilm recording systems for use with computers, filed on May 5 for 300,000 shares of common, of which 225,000 are to be offered for public sale by the company at $14 per share max. and 75,000 by the holders thereof. Underwriters headed by B.J. Lerner & Co., Inc., 618 South Spring St., Los Angeles, Calif. 90014.

XEROX CORPORATION

Xerox Corporation, Stamford, Conn. 06904, filed on May 30 for 239,232 outstanding shares of common stock, which may be offered from time to time by the holders thereof at prices current at the time of sale ($138.75 per share maximum).

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JUL 14 1972

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" JULY 13,1972 • VOL.7,NO.17 P.J.McGOVERN,EDITOR

"Insufficient evidence"

INDUSTRY STARTLED, IBM "GRATIFIED" AS PHOENIX COURT RULES AGAINST GREYHOUND IN ANTITRUST CASE

. . . it is still the law that size alone does not constitute an offense under the Sherman Act, nor does the mere possession of monopoly power. It is the wrongful use and exercise of that power which is proscribed by Section II of the Act.

Assuming [IBM] does hold a substantial share of the market, whatever that market may be, it is the opinion of this Court from the evidence adduced thus far on the record, that [IBM's] place in the industry has been achieved as a result of superior skill, foresight, and industry.

The Court is of the opinion that [IBM's lease and purchase pricing activity] was brought about by economic factors over which [it] had no control . . . that there is no evidence of an attempt to monopolize, in the record.

An early decision was expected in the antitrust case brought by Greyhound Computer Corporation against IBM (EDP/IR Dec.24,1971), but everyone thought that IBM's testimony would be heard . . that a jury would vote.

So as the Democratic National Convention was cranking up earlier this week, industry observers were startled to hear that Judge Walter E. Craig, in Phoenix Federal Court, dismissed Greyhound's claims against IBM (excerpts above). Greyhound reports that it "believes the court erred," that it still has an excellent antitrust case, and intends "promptly and vigorously to appeal to the Ninth Circuit Court of Appeals." This had not been done at presstime.

Nevertheless, IBM has scored a decisive victory in the round of court battles that began when Control Data walked into a Minneapolis court during the Fall Joint Computer Conference three-and-a-half years ago (EDP/IR Dec.23,1968). This case -- and a Justice Department suit brought early in 1969 -- is still pending.

Neither these cases nor a more specific one filed last year and recently amended by Telex are directly affected by the Greyhound decision. But IBM can't help but be heartened by a ruling -- at the earliest possible moment in the first antitrust trial -- that there was no evidence on which a reasonable jury could find that it had violated the antitrust laws as claimed by Greyhound (box, page 2).

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SUBSTANCE OF GREYHOUND COMPLAINT DISMISSED IN PHOENIX

IBM exercised its substantial powers in the general-purpose computer industry to exclude leasing companies as competitors by adjusting prices, services, and depreciation policies to render third-party leasing of IBM equipment unprofitable. These practices include, among other things:

- pricing equipment at unreasonably high levels in relation to IBM rental rates;
- pricing of new equipment at original price levels regardless of actual obsolescence of such equipment due to the approach of the end of a product life cycle;
- abolition of free support and software for which Greyhound had paid a bundled price at the time of purchase of IBM equipment;
- reduction of IBM lease rates after sale of more than $150 million of equipment to Greyhound.

On Monday, July 10, Judge Craig first told the litigants, with the Jury not present, the reasons he was ruling in IBM's favor. Then he called the Jury in and explained they were "entitled to a little explanation of why the delay." After a weekend of deliberation, he explained, he had decided to deny Greyhound's motions for a directed verdict and granted those presented by IBM.

> In reaching these conclusions, the Court attempted to evaluate all of the evidence. Not so much as to what the evidence showed, but what it did not show. Had the Court reached a conclusion that the evidence was sufficient in any one of these areas to present to the Jury, the Court would have done so.
>
> The Court is of the opinion as a matter of law that the state of the record cannot support that conclusion.
>
> The alternative . . . could have been to deny one or more of the motions, in which event we would have possibly enjoyed each other's company for another six weeks, and heard the defendant's [IBM's] rendition.

In conclusion, the Judge told the Jury that while he was sure it had learned something in this case, he couldn't waste their time, his time, of the money of the litigants "for something of an academic interest." He commended both counsel on the excellence of their presentations and preparation of the case.

Grounds for appeal?

Such thanks, of course, is little comfort to Greyhound. If the leasing company actually risks throwing "good money after bad" in the 12-to-18-month anticipated appeal process, much of its case will hinge on definitions: What sorts of acts or policies are necessary to constitute a "wrongful" or "illegal" use of monopoly power? Could evidence introduced by Greyhound have warranted a jury's finding that IBM committed such acts or implemented such policies?

Irregularities in trial procedure will be stressed in any Greyhound appeal, but the primary stress will be to prove that evidence already introduced indeed showed that (a) IBM controlled prices in the industry it dominated and that (b) IBM's acts or policies controlled entrance into such an industry.

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SUBSTANCE OF JUSTICE DEPARTMENT COMPLAINT

IBM has monopolized the general-purpose computer market by:

- bundling the price of hardware, software, and support services;
- pricing new computers at unusually low profit levels;
- announcing new computer models when it knew it was unlikely to deliver such models within the announced time;
- granting discriminatory price discounts to educational institutions.

SUBSTANCE OF CONTROL DATA COMPLAINT

IBM has monopolized the computer industry through:

- "exclusionary practices" including premature announcement and other misrepresentation of new hardware and software;
- discriminatory pricing in geographic or industrial markets in which competition is more intense;
- bundled pricing of certain products and services;
- establishment of technical standards to inhibit use of competing general-purchase computers or independently manufactured peripherals;
- encouragement of leasing rather than purchase of computers by unreasonably low lease rates;
- utilization of reciprocal buying power to influence computer procurement of customers;
- illegal tied marketing with the Service Bureau Corporation;
- violations of the 1956 Consent Decree by entering into timesharing services;
- monopolistic exploitation of patents.

More specifically, Greyhound can be expected to claim that it and the other leasing companies were competitors in an industry from which they then were excluded by IBM policies such as its pricing of System/370. Pursued in an appeal, this would once again require deciding

Whether IBM's price policies were a lawful and proper response to competitive pressures;

or

Whether IBM's price policies were an illegal use of monopoly power, implemented free from competitive pressures and only to maximize profits and control the industry on behalf of IBM.

In Phoenix this week, Judge Craig ruled for the former, then went on to state that "IBM's place in the industry has been achieved as a result of superior skill, foresight, and industry . . . brought by economic factors over which the defendant had no control." Antitrust experts consulted by EDP/IR consider this "highly unusual . . . a remarkable finding" since it was made before IBM introduced any evidence. The Judge essentially stated that, based on Greyhound's evidence and IBM's cross-examination, no reasonable man could find for the plaintiff, Greyhound.

IBM's reaction, not unexpectedly, approached sanctimony: "We are gratified by the result, which we had hoped for because we felt it was justified by the facts."

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What about the other cases?

In addition to giving IBM a taste of victory, the Greyhound ruling could have an impact on the other antitrust cases pending against IBM in various courts. The point of law -- Section 2 of the Sherman Act -- under which Greyhound was tried is exactly the same as that cited by Justice.

But the Justice Department's suit -- filed three years ago (EDP/IR Jan.28, 1969) and limping along once again since newly assigned counsel had to return to the ITT-Hartford Fire case -- involves much broader issues, including the question of whether other mainframe manufacturers have been illegally excluded from an appropriate share of the market.

Many pertinent issues could not be raised in the case brought by Greyhound Corp., simply because the third-party leasing company is not an IBM competitor in all areas . . . hardware manufacturing or services, for example. But the Justice Department can bring to its case any issue which might be raised by a competitor of IBM; therefore, its case is not particularly affected by IBM's first-round success against Greyhound.

The major civil antitrust case pending against IBM is the first one filed in the present round, the one by Control Data Corporation. It involves a wide range of issues (box, page 3) based on additional portions of the Sherman Act as well as sections of the Clayton Act and its Robinson-Patman Act offshoot. Much of the preparation and evidence from the Greyhound case -- IBM's COMSTAT (competitive status report) tapes, the court-ordered census of the data processing industry, and one or more of the expert witnesses -- will likely end up in court when CDC meets IBM a year or more from now.

Thus, Greyhound represents a valuable trial balloon for CDC, since it did smoke out IBM's reaction to the evidence that was submitted; the case is less valuable to CDC than it might have been, however, because IBM did not have to present its own evidence to significant issues such as relevant markets, market shares, or competitive posture during the 1960s.

The Telex suit -- challenging IBM's monopoly that makes "it difficult or impossible for Telex or others to attach their devices as plug-to-plug replacements for IBM's peripheral devices" and, through recent amendments to the case, attempting to prevent announcement of new products by IBM -- involves much narrower issues and only covers the last few years. Thus, it is not expected to be much affected by the Greyhound case, which generally was restricted to the general-purpose business computer marketplace as it existed during the middle and late 1960s.

Back to the courts

So the next decision in these major computer industry antitrust cases -- unless there is an out-of-court settlement of some sort -- is not expected until late 1973, at the earliest. That's a lot of months and a lot of dollars away.

The final disposition of these antitrust cases will determine the course of the information processing industry for the last half of the 1970s; they are being tried on the basis of evidence describing the late 1960s. The intervening years will be ones of slow but steady change in the industry, and EDP/IR can only wonder whether rules based on the 1960s will be appropriate when they finally appear.

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Wheat AND computers?

SEVERAL FACTORS SUGGEST MORE COMPUTER TRADE WITH USSR AND EAST EUROPE; INDEPENDENT PERIPHERAL EQUIPMENT MANUFACTURERS COULD ALSO REAP BENEFITS

Information about the computer marketplace east of the Iron Curtain is sketchy at best. Some general information is picked up by U.S. business reporters, a little more comes in from Britain because International Computers Ltd., headquartered there, has been the number one foreign supplier to East Europe.

And one of the most consistent sources of news about Soviet computer activity is Soviet Cybernetics Review, edited by Wade B. Holland of The Rand Corporation. For some months, now, this journal has been anticipating the arrival of the USSR's new Ryad or ES (for Unified System) series system, based on the IBM System/360. So it was with considerable interest that news of deep trouble with Ryad arrived almost the same day as the suggestions that U.S. trade with the Soviet Union may be about to take a turn for the better. In the May, 1972 issue of SCR, Holland writes:

> With a whisper rather than the anticipated shout, the long-awaited announcement in the Soviet Union of the Ryad third-generation computers was made in late January. The event was overshadowed by the creation of a new computer agency and the convening of an unprecedented conference that strongly indicated a major intrusion of the Communist Party in an attempt to resolve chronic problems that plague Soviet computers.
>
> There is mounting evidence that the protracted, costly effort to build third-generation machines on a par with those of the West has been considerably less than successful. And speculation is developing that government and Party leaders have come to the realization that something is very wrong in the computer industry. Furthermore, there is every reason to believe that the assurances of computer experts that they can solve their problems and catapult the industry into the third generation are coming under serious question.

To the U.S. computer industry, this comes almost as icing on the cake. For some time, the computer facts from the East have caused American suppliers to indulge in what often seemed like wishful market planning for the Soviet Bloc:

- Computer technology in the USSR and her East European satellites is at least five years behind the U.S., and concentrated in the process industries. But Kremlin bureaucrats now more than ever are talking about computers to control overall economic development and provide more consumer amenities.

- Even if optimum Ryad production goals were met, announced demand will exceed production by almost 10,000 computers by 1975. Indeed, the Soviet Union today has only one-tenth the value of computers per GNP dollar as the U.S. (EDP/IR Dec.17,1971), a difference of about $13 billion.

Finally, this potential marketplace may be opening. Long-standing U.S.-Soviet trade difficulties seem about to be settled so that Russians can have corn-fed beef on their tables; only a few half-measures are being taken to counteract what appear to be extremely serious startup problems with the single computer system selected for the USSR's move into the third generation.

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So even though political considerations still remain the major obstacle to Soviet Bloc trade, American suppliers have legitimate reason to size up the Soviet Union as a computer prospect. Honeywell in April announced the order for $5 million worth of Series 600 equipment to Gosbank, the national bank of the USSR; IBM just this month finally received clearance for shipment of a 360/50 to the Soviet Ministry of Chemistry; Calcomp has reported the sale of a flatbed plotting system during the recent Moscow Computer 72 Show at which interest in U.S. computer products was reported high. Such isolated incidents will probably continue, becoming more frequent.

But any major stimulus for U.S. manufacturers would seem to require concentrated efforts. Here are some of the major considerations:

- Soviet scientists, skilled in both space and military rocketry, are neophyte in computer design, manufacturing, and utilization. An estimated 5,500 computers are currently in use in the Soviet Union, but a large -- and unknown -- portion of these are plugboard wired or semi-programmable computers. Any large U.S. entrance into the Soviet marketplace must therefore include substantial cost for training, support, and maintenance.

- The geographical distances between different government and industry centers in the Soviet Bloc is enormous. This factor, with the field support requirements it implies, could make wide-scale entry into the Russian market possible only for the largest American suppliers.

- The administrative log jam -- under which the Office of Export Control in Washington must review each computer order for its strategic implications and issue an individual license -- must simply be swept away with some type of product guidelines for approval. And Soviet buyers -- bureaucrats within government agencies and research institutes have their own version of red tape. This would probably be worsened if numerous Western suppliers begin to offer tempting proposals.

And if all of the above starts sounding like it's up to IBM to lead the way into this potential new market, read on. For the past several years, Soviet planners have concentrated computer development efforts on the IBM/360 compatible Ryad series, five or six compatible models ranging in size from System/3 Model 10 to the 360/65. Development responsibility was parcelled out among the various Soviet Bloc (Comecon) nations, and broken down to various research and factory centers to handle specific assignments such as disk drive engineering or software.

This is certainly one reason for the production delays being reported. In the computer industry's short history, only IBM has succeeded in the complicated task of coordinating massive full line system development in many countries, and this accomplishment has been due in part to its own ability to utilize computers in program management, engineering design specification interchange, and systems integration. The Russians have apparently tried this, as the following excerpts from Izvestiya and Pravda (translated by SCR) illustrates:

> The design of third-generation computers requires cumbersome calculations which can only be executed by computers themselves. It is possible now to intensify all tasks related to design documentation. The computer development process proceeds in several stages . . . development and production . . . at different rates. If production increases, design lags.

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There have also been some other problems that sound remarkably like the things that go wrong in many U.S. development and manufacturing situations:

> In developing third-generation computers, the leading role belongs to mathematicians and system analysts. Unfortunately, an insufficient number are being produced. Moreover, organizations that use computers are enticing mathematicians by offering them higher salaries. It would be proper to transfer some of the profits [from plants] to the institute that develops the computers, and in this way to give incentives to the designers of advanced equipment.
>
> Some institutes that produced inferior parts received greater rewards than those that did high-caliber work.
>
> For various reasons, computer development is dispersed over several different ministries and departments. Thus, it has not been possible to avoid duplications of research projects, resulting in dissipation of funds and specialists. This hinders concentration of available resources.
>
> Third-generation computers need special motors, wires, and electrical products [in] small quantities, yet it is impossible to do without them. Production of these items is costly and unprofitable, especially during early stages. Enterprises of the USSR Ministry of Electric Engineering Industry are attempting to avoid unprofitable orders. Today, for example, computer design organizations and plants cannot obtain the special wire used in computer assembly.
>
> The chemical industry delivers dielectrics for etching, and magnetic memory tapes. The pulp and paper industry is responsible for the production of punchcards and papertape. All these products must be of the highest quality. Yet, these products are often received from the plants with gross deviations from standards, and yet the penalty for substandard products is not significant. For example, in 1971 [a center] was forced to reject three batches of 400,000 punchcards each. A chemical plant produces substandard magnetic tapes.

The same sources give a pretty good indication that there may well be some business in the USSR for independent peripheral vendors that can cope with the obvious bureaucracy involved. The following was written in January 1972 about the Ryad 20, a smallish 360/30 size computer:

> The ES-1020 computer will be available to users soon. Will they be able to utilize its immense capabilities with a maximum return? It is difficult to say. The production of several dozen peripheral devices necessary for its efficient operation is being organized very slowly. Without communication hardware, it is impossible for the computers to serve users located at remote points. In addition, it is necessary to have portable terminals. So far, production has not even been organized. There is a shortage of devices for storing large volumes of information -- a necessity for the development of information systems. When will their production be undertaken? This is not known.
>
> The ES-1020 computers, which has been approved for quantity production, brings with it many important and complex problems. The solution of these problems must not be postponed.

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The Russian emphasis on Ryad -- with its byte rather than word orientation -- has stimulated sales of 360-compatible systems, notably the System 4 built by ICL under license from RCA. Also, Ryad protocol has opened doors for IBM compatible peripheral products from the U.S. Finally, third-party leasing companies have hopes for their IBM peripherals if not for complete systems returned by customers in the U.S. (Could these be labeled "Tested in the West"?) The big stumbling block at this stage is the exact architecture of the Ryad, or the status of delayed product lines.

Vodka for computers?

In addition to the possible technical problems, non-mainframe American manufacturers would be hard pressed to deal with the current Soviet Bloc "barter" economics. As one American computer executive puts it: "We can sell a boat load of computers to the Poles if we are willing to take several train loads of vodka in exchange." Once export guarantees are available from the Import/Export Bank or suppliers receive other Federal support, this barrier need not be a serious obstacle.

Until then, there is hope for smaller suppliers, but not for the big chunk of dollars potentially available. Communist countries have limited amounts of "hard" currency, but suppliers would view any such cash purchases -- without the attendant service problems -- with enthusiasm. And, at least on a limited scale, currency conversion may no longer be a problem for the small EDP equipment supplier. During the past few months, a lively interest has sprung up among international financial organizations that are willing to take vodka, metallic ores, and other commodities in trade, turning over cash to the American EDP supplier.

The real potential

The Soviet Union has a penchant for American computer technology, and a current shopping list said to be several hundred million dollars for openers. During recent months, there has been an intensified, two-way exchange of computer industry specialists and businessmen between our two countries. The Soviets are definitely placing increased emphasis on expanding the "computerization" of the civilian sectors of their economy. Reportedly, a high Communist Party official told his American hosts about computer hopes in the USSR: "We will do it. However, we will prefer to do it with your help."

The exact nature of the help is by no means certain. In the automotive area, the Russians in the past have opted for a facilities management type approach, turning to Ford and Mack Trucks to set up and run complete plants. And with the reported problems in getting the Ryad series into production, there is the possibility of a similar situation for computers. It would be much more complex, of course, for the long list of reasons that the computer industry isn't very much like the automotive industry.

Computers have been aptly described as intellectual power tools, as methods for duplicating human skills with great speed and agility. Even in its most mundane business application, the computer is a system that requires software and knowhow to be profitable. And the Russians talk of sophisticated networks that rival the most up-to-date distributed processing systems in the U.S. But most reports are that the East is even further behind in software than in hardware. The help for the USSR is available; providing it would require more open doors and probably the admission of U.S. companies, operating at a profit.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" JULY 27,1972 • VOL.7,NO.18 P.J.McGOVERN,EDITOR

Beehive or hornets' nest?

FEDERAL MARKET OPENS TO LEASING COMPANIES AND MEMORY MAKERS AS GOVERNMENT INCHES TOWARD STREAMLINED PROCUREMENT CYCLE

Sometimes the Washington computer marketplace looks like one big game of Uproar.

It's IBM against the General Services Administration (GSA) . . . peripheral suppliers against the agencies . . . the mainframers against each other . . . third-party leasing companies sometimes playing one side, sometimes the other . . . and -- of course -- everybody against IBM.

And for good reason. An installed computer base of almost $2 billion makes the U.S. Government the biggest EDP customer in the world (see page 2). It may also be the most frustrating. Here's a synopsis of developments that make the computer procurement scene one of the better shows in Washington . . . even in an election year:

- Last December, IBM protested the GSA's refusal to limit liability in its model contract for the Air Force's Advanced Logistics System (ALS). The General Accounting Office upheld the GSA's position in this and two other cases. IBM plans no further appeal (which would have to be in the courts), but currently the Industry Giant and the GSA are waging their annual Federal Supply Schedule contract negotiations, and it's probably safe to say that "unlimited liability" is one of the subjects under discussion.

- Third-party leasing companies are finally getting a crack at the Federal Government market. Itel recently won the largest contract so far, and will be installing almost $9 million worth of 360s and compatible peripherals at the FBI. Leasing companies and the GSA have drafted a model leasing contract that could give the third-party lessors a better deal than they had been getting . . . but only if the various Federal agencies decide to use it.

- Everybody and his competitor gripes more and more about the prohibitive costs of proposing and benchmarking computer systems; many parties complain about agency sole-sourcing practices. This practice actually seems to be on the wane, but the procurement cycle on big bids seems to take as long as ever. GSA is studying this problem.

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FEDERAL GOVERNMENT MARKET FOR GENERAL-PURPOSE (GROUP A) COMPUTERS
(Based on Government Inventory, June 30,1971 & EDP/IR estimate for Jan.1,1972)

	Number	Values $ Millions	% Share by Value	$ M in U.S.1/1/72	% Mfgr. Base in Federal Govt.
IBM	1,366	$ 768	41.6%	$18,931	4.1%
Univac	845	224	12.2	1,296	17.3
RCA	171	133	7.2	896	14.8
Subtotal	1,016	357	19.4	2,192	16.3
CDC	180	341	18.5	852	40.0
HIS	268	141	7.7	2,103	6.7
Burroughs	204	104	5.6	1,180	8.8
XDS	58	77	4.2	232	33.2
NCR	298	43	2.3	530	8.1
DEC	23	12	.7	75	16.0
TOTALS	3,413	$1,843	100.0%	$26,095	7.1%

This year, there have been a few significant plums in the Federal peripherals market. For one, Cambridge Memories won a contract to install a large number of its replacement/add-on main memories on Army 360/30s; this award bodes well for the rapidly growing main memory portion of the independent peripheral equipment business.

Contrary to what might be expected, however, the Federal market isn't exactly a piece of cake for the plug-compatible peripheral equipment manufacturers. Third-party leasing companies are working hard to install their IBM-compatible equipment, and the other manufacturers are out to knock out any IBM equipment.

Look who's complaining!

During the last eight or nine months, a slew of giant-sized contracts that had been delayed and debated ad nauseum were finally awarded, starting with the long-discussed Wimmix award to Honeywell back in October. (See table, page 4.)

IBM protested three of the procurements: the Advanced Logistics System (eventually won by Control Data); the Navy's shipyards procurement (Honeywell); and the Defense Integrated Supply System (Burroughs). It complained to the General Accounting Office that the GSA refused to include a liability limitation clause in the contracts, and that the potential liability could amount to billions of dollars.

The GAO upheld the agency's position in all three cases, finding no legal basis for correcting the action. But in reporting its finding, the GAO made statements sympathetic to IBM's position, essentially saying that the inclusion of unlimited liability isn't particularly desirable; IBM says it's impractical.

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IBM SYSTEM/360 COMPUTERS USED BY U.S. GOVERNMENT

From an analysis of the latest Inventory of Government computers, EDP/IR has compiled the following table of IBM System/360 equipment in use at the end of Fiscal 1971, one year ago. (EDP/IR Dec.31, 1971 contains other details from this document.) Although slightly over half these computers are leased (whether from IBM or a third party isn't specified), they represent only about 40% of the value of 360s installed at Government installations, because most of the leased machines are 20s and 30s.

Portions of this $300 million worth of rented or leased equipment are being made available for replacement by third parties or independent peripheral manufacturers. There is also a trend toward purchase. IBM offers the GSA rental accruals or credits for the first two years a piece of equipment is in place (vs. only one year for standard commercial customers) and it reports that the Government would have between $5 million and $6 million in credits if it picked up all outstanding options on its 360 equipment.

Model	Government Owned	Contractor Supplied	Rented or Leased	Total
360/20	37	4	118	159
360/25	0	0	8	8
360/30	66	4	72	142
360/40	50	2	44	96
360/44	12	1	2	15
360/50	38	5	51	94
360/65	47	2	31	80
360/67	5	2	0	7
360/75	14	0	0	14
360/85	0	1	1	2
360/9X	5	1	0	6
TOTAL	274	22	327	623

In a related letter sent to the Business Equipment Manufacturers Association (BEMA), IBM complained that the GSA's model contract drawn up for the procurement would "stifle . . . innovative offerings" and that the GSA's "unilateral" changes in contract conditions in the middle of the procurement process were unreasonable.

Other mainframers also moan about the procurement jungle. Drawing up proposals, wading through red tape, passing stringent benchmark tests, keeping a large staff busy for months or years . . . all this can run into millions of dollars, a huge gamble for the chance to place computers at heavily discounted prices. Bids on multiple-system procurements have sometimes been shaved to 50% or less of the manufacturers' list price.

IBM readily admits that it is being "more selective than in the past" about bidding on Government contracts, and there is substantial industry talk that, if things don't improve, some mainframe companies might drop out of most bidding completely -- leaving the Federal Government with fewer competitive proposals than ever. But with today's competition, this threat doesn't seem imminent.

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RECENT MAJOR GOVERNMENT COMPUTER PROCUREMENTS*

Date Awarded	Winner	Projected Value**	Agency/Project
10/71	HIS	$51.3M	Defense Dept. World Wide Military Command and Control System (Wimmix)
3/72	Burroughs	$24.3M	Defense Supply Agency Defense Integrated Data Systems (DIDS)
3/72	HIS	$12.9M	Navy shipyards procurement (Navships)
4/72	CDC	$83.4M	Air Force Advanced Logistics System (ALS)
6/72	CDC and IBM	Est. at $70M	Atomic Energy Commission, for laboratories (Prices being negotiated.)
(Not yet awarded.)			Army Standard Automated Material Management System (SAMMS). (To replace 12 IBM 360/50s and 65s and other computers.)
(Not yet awarded.)			Army's Local Distribution Message Exchange (LDMX) computer procurement for up to 27 communications computers.
(Not yet awarded.)			Defense Commercial Communications Office, procurement for 20-to-54 computer-based terminals for Autodin network.
			Peripherals Procurements
3/72	Storage Technology	$ 5.5M	Social Security Administration procurement to replace IBM tape drives and controllers.
3/72	Cambridge Memories, Inc.	na na	Army Base Operations (Basops) procurement to add and replace main memory on up to 37 360/30s Navy contract to install main memories on six IBM 360s (Models 30, 40, and 50).
6/72	Ampex	$ 3.2M	Navy contract to replace drums and add disk storage capacity to Univac systems.
6/72	Telex	$ 1M	Navy contracts to install 114 tape drives and controllers.
(Not yet awarded.)			Army Basops procurement to replace 440 installed and planned IBM peripherals.

* This list is not necessarily complete.
** Revenues over expected life of contract if options are exercised.
na Not available.

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The GSA at least admits it has a problem. Its answer? It has begun a study on how to shorten the procurement cycle. Naturally, it will be several years before the study is completed and can result in any real improvement in the procurement cycle.

It's ironic that while the agencies and the GSA have pooled equipment buys, dug in their heels in negotiations, and played off one supplier against another in order to save money . . . they are still being criticized by leasing companies, peripherals manufacturers, and even mainframers for failing to take full advantage of some moneysaving steps. It's a hard battle to win.

The sole source blues

Government policy is to go out for competitive bids on computer procurements whenever possible. But --

- An agency with a rented computer may convert to purchase without necessarily asking for other bids. The Office of Management and Budget says only that agencies must evaluate alternate sources of supply. This can be done internally.

- Even when a system is put out for bids, the specs may be so restrictive as to weigh heavily in favor of one supplier. For instance, a Justice Department procurement called for IBM maintenance on the desired 370/155 system -- hardly an encouraging prospect for companies that might want to bid a system with independent peripherals.

About six months ago, the GSA put out a regulation saying that agencies bringing in rented computers from elsewhere in the Government must treat this situation just like a procurement action. When EDP/IR asked the GSA whether or not agencies were cooperating in this matter, the agency replied that it had no evidence that they were not. It said that prior to the regulation, this type of sole-sourcing had been a growing problem.

This may be the case. But industry sources tell EDP/IR that government agencies seldom ask for formal bids before "recruiting" a computer from another part of the government. Thus, they never find out just how low the leasing companies might be willing to go to meet what essentially is IBM competition.

In summary, we get the feeling that the sole-sourcing picture looks something like the New England weather forecast this summer: variable cloudiness -- or is it variable sunshine? -- and more or less some improvement in sight.

A new model contract for leasing companies?

Despite IBM's drive to convert Federal computers over to purchase (see comment in box, page 3), agencies during the past few months have been trying harder to do business with the leasing companies. Over the past year the leasing companies have bid on a number of contracts, but frequently they have lost out to low purchase prices from IBM.

But IBM is being more selective, just as it reports. It didn't bid on the FBI contract, won by Itel, to replace two 360/65s and a 360/50 in the National Crime Information Center. This is Itel's first government leasing contract, the result of its having had a man in Washington for the last year working toward

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future business such as this. Itel reports that this order justified the year. Other major leasing companies -- as well as firms such as Federal Data Corp. that package components from various suppliers for bidding -- have also sought and won Federal contracts for leased 360 configurations.

Leasing companies face a particularly sticky problem in doing business with the Federal agencies: The agencies can't legally commit funds for more than one year. (This same restraint prevents them from taking advantage of the 24-month, 16% discount in IBM's fixed-term lease plan for peripherals.)

This provision hasn't been a particular problem thus far. Third-party leasing companies are glad to get even one-year leases on any 360s being abandoned by previous customers, and -- with the Federal market so far barely tapped by the leasing companies -- quite a few 360s may find government homes during the next year or so. But prospects for 370 leasing aren't so bright. At this point in time, it's unlikely that any lessor, even one willing to take an operating or risk lease on a 370, will write only a one-year lease for the government or anyone else.

For the business they do decide to go after, however, the leasing companies may soon have an easier time because of a model contract that has been developed. If agencies agree to use this standardized form, bidders can reference it in their proposals and thus save a lot of individual negotiations. Even more important, the model contract would soften some of the terms that previously made government business somewhat unattractive to third-party leassors. Several key points in the 150-page draft of the lease were described to EDP/IR:

- The lease allows for a 90-day cancellation notice rather than the 30 days that has been customary to date.

- In the event of late delivery of equipment, the vendor pays only the difference between IBM rental and the proposed price from the winning bidder, rather than the full IBM rental.

- The leasing company need only guarantee that Type I software (IBM's "free" system software that is needed to run the equipment) be provided the agency.

- A particular vendor may bid on only part of a system, rather than being required to bid on the whole thing. This presupposes, of course, that other bids will cover the remainder of the system.

It's one thing to develop such a model contract, of course, and an entirely different matter to "sell" it to a particular agency. Many of them have reputations for going their own way in computer procurement. Also, people in the leasing business differ in the amount of weight they attach to the standardized contract. But it should prove helpful, certainly of no harm.

Uncle Sam and the peripheral manufacturers

Even though government agencies can't yet take full advantage of IBM's fixed-term lease plan (EDP/IR June 2, 1971), it has impacted the marketing efforts of the independent peripheral manufacturers, just as it has elsewhere. And IBM's active conversion-to-purchase efforts haven't helped, either. Furthermore, the biggest disk and tape replacements in the government are over (EDP/IR Dec.9,1970).

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But the Federal market for independent peripherals has by no means dried up. Last month, for example, Telex announced a $1 million contract to deliver 114 IBM-compatible tape drives and controllers to the Navy. Currently in the mill is an Army procurement of tape and disk drives, printers, and card punches to replace installed and contemplated IBM devices. (The contract was recently postponed once more.) And the GSA says it is putting together a large plug-to-plug compatible peripherals procurement, but won't give details.

The independents also have a chance at more routine acquisitions, at least in cases where peripherals are split out for separate bidding. This appears to occur mostly when agencies look for leased computers to replace their IBM systems. Alternatively, peripheral companies may subcontract to leasing or other firms that package plug-compatibles with IBM mainframes for bidding.

The prospects for bidding only the peripherals portion on new system procurements are not good, however. Peripherals were not broken out for bids in any of the superbuys of the past year. And even if they were in the future, it's unlikely independents would be seriously interested in jumping into the melee.

For one thing, the biggest awards have been to non-IBM mainframers. And even if IBM were to win, problems of designing and benchmarking the peripherals portion of a system when the mainframe configuration is unknown becomes a difficult proposition indeed.

But the government market looks particularly sunny for one type of "peripheral" -- add-on/replacement main memory. Last March Cambridge Memories won a contract to beef up 37 Army 360/30s beyond the IBM memory limits (as well as to replace some of the installed IBM memory), and another one to install main memories on six various 360s in the Navy. Uncle Sam had been getting main memories before that, starting in December of 1970 when the AEC bought a Data Recall memory, but CMI's order was the first massive procurement. Today, memory makers report that the agencies are putting out more and more specs.

It makes sense. The government has a lot of purchased computers; it is cost conscious; and replacing IBM memory with plug-compatibles or extending the main memory beyond IBM limits is a way to save money and/or gain capacity without moving up to a 370. It's conceivable that the GSA might put together a procurement including or consisting of main memories, but EDP/IR has no information as to whether or not main memory might be part of the upcoming GSA peripherals buy.

The big winners

For scorekeepers, the table on page 4 gives a rundown on some past and upcoming contract awards. Deliveries on these contracts stretch over a period of months, so the associated revenues don't show up in company sales immediately. (Deliveries in the Wimmix procurement, for example, may extend through December, 1973; on ALS, through July, 1973.)

And in all cases the estimated contract values are not guaranteed amounts, but rather income expectations over the life of the contract if various order options are exercized. And the gravy for contract winners, of course, is from follow-on contracts that until now could be expected as a result of having a system installed. Today, however, the liklihood of such add-on plums is decreased. The Federal computer buyers are shopping around for better values. At least it means better DP management, and fewer tax dollars for computers.

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NEW REGISTRATIONS BY COMPUTER COMPANIES

[Listed below are brief descriptions of proposed security offerings, from firms in the data processing field, that are currently in registration with the Securities and Exchange Commission. The preliminary prospectus for any issue may be obtained from the underwriter.]

COMPUTER CONSULTANTS INC.	Computer Consultants Inc., 1613 University Blvd., N.E., Albuquerque, N.M. 87102, a company that designs and operates business information systems, filed on June 29 for 300,000 shares of common to be offered at $5 per share. Proceeds will be used to repay $625,000 of long-term and short-term borrowings and notes payable and other purposes. No underwriter.
COMPUTER DIMENSIONS, INC.	Computer Dimensions, Inc., 511 North Akard St., Dallas 75201, a company that furnishes data processing services to transportation, financial, and other industries, filed on June 29 for 400,000 shares of common to be offered at $12 per share, max. Proceeds will go to repay bank borrowings and other purposes. Underwriter headed by Allen & Co. Inc., 30 Broad St., New York 10004 and Eppler, Guerin & Turner Inc, 3900 First National Bank Bldg., Dallas, Tex. 75202.
CODEX CORPORATION	Codex Corporation, 15 Riverdale Ave., Newton, Mass 02195, a company that makes and markets data communications equipment, filed on June 28 for 200,000 shares to be offered at $22-3/8 per share max. Of the proceeds, some $2.148 million will be applied to reduction temporarily of bank borrowings. Underwriter is Kuhn, Loeb & Co., 40 Wall Street, New York 10005.
DATA DISC, INCORPORATED	Data Disc, Incorporated, 686 West Maude Ave., Sunnyvale, Calif. 94086, a company that designs, manufacturers and markets disc memory devices, filed on June 26 for 250,000 shares of common (150,000 to be offered by company at $7 per share max., 100,000 being offered by holders). Underwriters are Birr, Wilson & Co., Inc., 155 Sansome St., San Francisco 94104 and Woolard & Co., Inc., 135 S. LaSalle St., Chicago 60603.
HONEYWELL INC.	Honeywell Inc., 2701 Fourth Ave. South, Minneapolis 55408 filed on June 16 for 416,666 shares of common deliverable upon conversion of $50 million of 6% subordinated guaranteed convertible debentures due 1986 of Honeywell Capital N.V., wholly owned.
MSI DATA CORPORATION	MSI Data Corporation, 340 Fischer Ave., Costa Messa, Calif 92627, a company that makes electronic source data entry systems, filed on June 6 for 397,170 shares of common, of which 300,000 are being offered by the company at $14 per share max. through F. Eberstadt & Co., Inc., 61 Broadway, New York 10006.
UNITED DATA CENTERS, INC.	United Data Centers, Inc., 100 Putnam Green, Greenwich, Conn. 06830, filed on June 26 to register 438,758 outstanding shares of common, including 38,515 shares being offered by certain former stockholders of Dynafacts, Inc., to be offered from time to time at $7.38 max. The company provides commercial data processing and programming and other related services.

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"THE GRAY SHEET" AUGUST 15,1972 • VOL.7,NO.19 P.J.McGOVERN,EDITOR

Not "Reset to zero" . . . Set to infinity!

IBM SELECTS VIRTUAL STORAGE FOR THE SEVENTIES

Virtual storage . . . IBM's most significant announcement since 1964 . . . a turning point in computer economics.

The narration of the animated film ended. And as the lights came on, thousands of computer users in 20 cities across the United States -- all guests of IBM -- began to wonder how significant all this really was.

During the presentation -- itself almost stymied by Telex legal action -- IBM had discussed MOS field-effect memories, virtual storage, two new computer models, and lower pricing for 3330 disk drive controls. But the full impact of Smash (as announcement details were said to be code named) took a little reflection. The hardware wasn't really the important item being introduced.

This was the real System/370 announcement . . . a software announcement . . . a definite turning point in the mainstream of computer usage. And buried in the announcement details were hints of IBM's possible New Computer Economics.

The "computer economics" directly referred to in the film, of course, are those related to the computer user. IBM summarized these in a series of flashy new brochures about the hardware and software:

> When first introduced, System/370 computers took a giant step into the Seventies by offering significant improvements in price/performance. The next logical step was to offer similar advances in people/performance.
>
> There was a time when computer hardware represented the principal investment in a data processing installation. Today, the biggest part of that investment is in the people who use computers.
>
> To raise the yield on your people investment, you have to increase their performance potential. System/370 with virtual storage can help you do just that. . . Your people have much greater flexibility in the design and programming of applications ... they can spend less time maintaining current programs ... and they can schedule and run jobs with greater freedom than ever before.

So what's in this for IBM? More hardware sales, to be sure. That's where the

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dollars are. And these are insured by the virtual lock. IBM has said, in effect: "Don't worry about programming; all computers can now have 16 million bytes of memory. You can operate all your old programs while you experiment with new applications. And once you get lots of new jobs running on your small 370, you'll want to increase memory . . . or add peripherals . . . or move up to a larger CPU so that you can run these jobs more effeciently. Give us a few extra hardware dollars and we'll save you lots of programmer dollars."

The announcement was certainly telegraphed by IBM. When T.V. Learson, company chairman, gave the Keynote Address at Spring Joint Computer Conference last May, most press reports picked up on the $40 million he promised to invest over the next five years in providing data security for computers. At the beginning of his talk, however, Learson had mentioned new developments -- "very large memmories" and, in association with them, "easier programming."

> There's little point in my romancing you with a lot of fancy numbers on what's coming down the road in computer systems.
>
> Most of you are well aware of what's on the way and what those new developments will mean. Probably at no time in the whole 20-year history of this industry have we ever stood at the brink of greater technological change in the makeup of systems.
>
> Let me simply say these developments should make the computer easier to use. Easier to program. They should make it possible for us to store huge data files and have easy access to them. And they should help us to get on with new applications where the barrier, until now, has been cost.
>
> To summarize this assessment, I would say that the use of data processing, the added new applications on current and oncoming systems, will measure up very nicely to the historic growth rate of the past.
>
> For there is no shortage of need. And certainly no shortage of creativity among professionals like you. [Emphasis added.]

Learson then went on to say that the only thing that can really inhibit such gains are worries that "the computer may turn into a monster. Get out of control." And the bulk of his talk related to these worries. But he certainly fingered IBM's latest announcement for those who were listening. The details are discussed in this issue of EDP Industry Report.

In the same speech mentioned above, Learson also talked about the general recovery of business that was (and is) under way. He says that "we have cleaned house" on installations where performance wasn't up to par, and that "we are back on the rails. Developing ways for using the computer to help management to do a better job." He also threw out another teaser:

> From my meetings with top executives throughout the country, I hear nothing that would suggest they have lost confidence in the computer. On the contrary, they see it -- more than ever -- as an indispensable tool . . .
>
> But the ground rules have changed and changed most sensibly. Today they are insisting they be guaranteed a good return on their investment. And they are insisting they be able to see that return over a sensible period of time.

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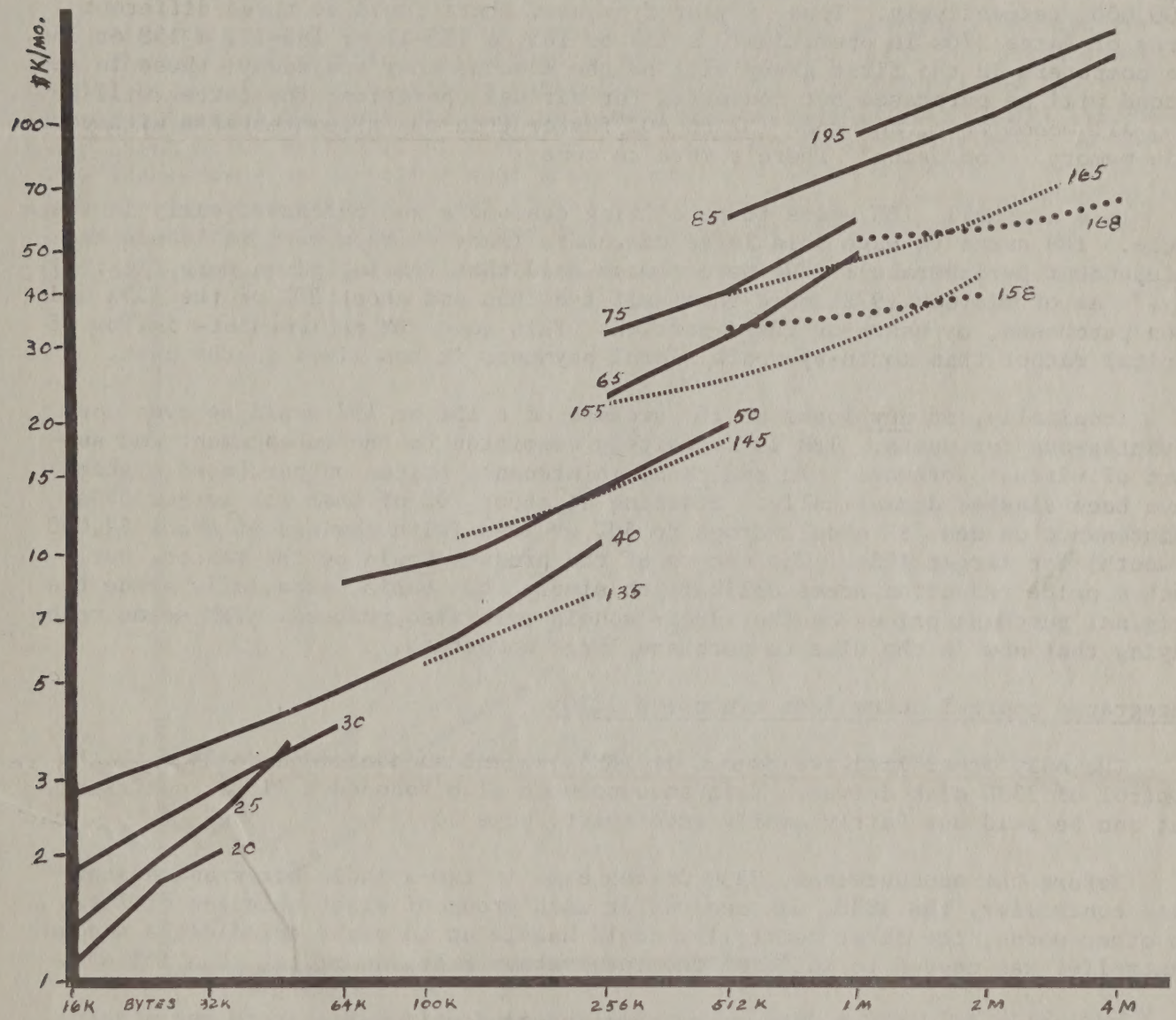
This, and the recent announcement, suggests that perhaps there will indeed be a New Computer Economics for many computer users. That a controlled shift toward purchased computer systems -- already showing up in user plans -- may be part of IBM's long-range plan. And that such a shift on IBM's part will not be the anathema or sacrilege that observers might imagine at first glance. Carried to a logical conclusion, this concept doesn't wind up being all bad. EDP/IR has a few thoughts on this, also. But first, some specifics from IBM's August 2, 1972 announcement. Let's see why this might be called a turning point.

New mainframes mean no more core

As part of the announcement, IBM said that all 370/135s and 145s will be converted for virtual storage operation during the next four months. This will cost users nothing, since the instructions for Dynamic Address Translation (see box,



MAIN MEMORY AND CPU AVAILABILITY of IBM System/360 & 370 computers is shown above, with CPU+Memory rental plotted against memory size on a log-log scale. Power can't be plotted so easily: In general, the 135,145, & 158 are 1.5 times the 40,50, & 65; the 168 is about the same power as Model 85 in System/360.

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page 6) are already in the CPU or can be added to reloadable control storage via a new floppy disk.

At the larger end of System/370, the situation is a little more complicated. IBM introduced two new processors -- the 158 and 168 -- that are designed for virtual storage operation. These have cache (or buffer) memories like the 155s and 165s they succeed, but have monolithic (Metal Oxide Semiconductor) main memories that are two to three times faster than the core memories in the older large 370s. For rental customers, IBM will be replacing 155s and 165s once delivery of the new CPUs begins -- April of 1973 for the 158, August for the 168.

But the 155s and 165s that have been purchased (by users or by third-party leasing companies for customers) cannot be field upgraded to 158s and 168s. They can be converted for virtual storage operation, but this will cost $200,000 or $400,000, respectively. Thus, a year from now, there could be three different types of large 370s in operation: a 155 or 165, a 155-II or 165-II, a 158 or 168. The computers in the first group will be the same as they are today; those in the second will be purchased but converted for virtual operation; the latter will be new, all monolithic, and some 10% to 40% faster than their counterparts with core main memory. Confusing? There's more to come.

In a nutshell, IBM seems to penalizing customers who purchased early in the cycle. IBM seems to have told large customers (many of whom went to leases and independent peripherals): "We have always said that renting gives more flexibility." As of midyear 1972, more than half the 165s and about 30% of the 155s had been purchased, by users or third parties. This gave IBM an immediate inflow of capital rather than month-by-month rental payments it has liked in the past.

Ironically, it now looks as if purchase of a 158 or 168 would be even more advantageous for users. IBM is definitely committed to the enhancement and support of virtual software. In addition, maintenance prices on purchased systems have been slashed dramatically. Starting at about 70% of that for larger 370s, maintenance on new "8" models drops to 50% or less (with savings of about $2,000 a month) for larger 158s. The nature of the product could be the reason, but such a price reduction seems unlikely on simply this basis, especially since the original purchase prices on the larger models were also reduced. IBM seems to be saying that now is the time to purchase large computers.

Integrated control means less expensive 3330s

The only other hardware aspect of IBM's recent announcement dealt with the control of 3330 disk drives. This announcement also sounded a little confusing, but can be laid out fairly easily (see chart, page 5).

Before the announcement, 3330 drives came in two-spindle boxes and a separate controller, the 3830, was needed for each group of eight spindles or less. In other words, the first controller could handle up to eight spindles; a second controller was needed to increase the total above 8 but no higher than 16; etc.

Effective in October (about the time independent manufacturers begin shipments of 3330-compatible drives), IBM is plitting the control function for 3330s. Part of the control will be handled by a new two-spindle box called the 3333. In new installations, each chain of up to eight spindles will consist of one 3333 box (priced about 25% higher than a 3330) plus up to three 3330 boxes. Thus, 12 spindles would consist of two 3333s plus four 3330s.

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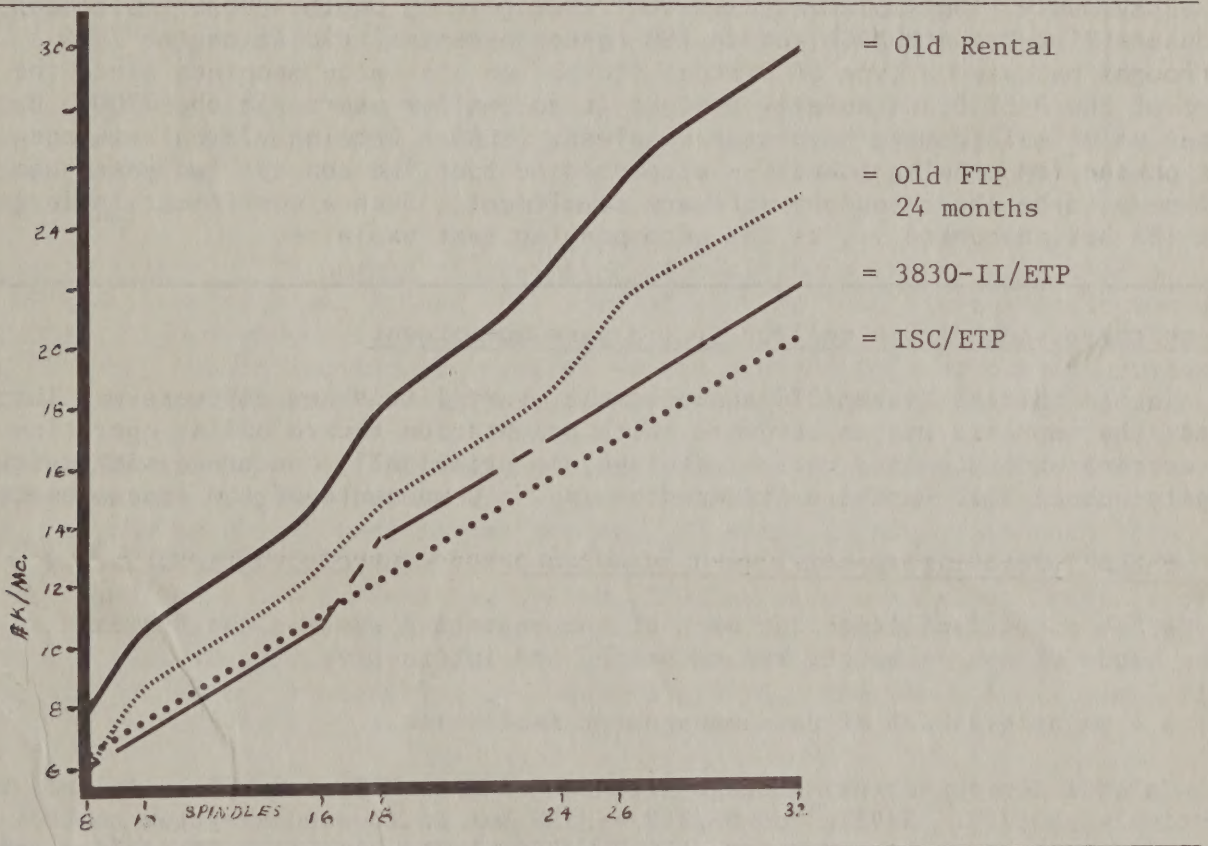
Under the new setup, the remainder of the control function will be handled in one of two ways. Either a 3830-II (priced a little lower than the original 3830) will be required for each 16 spindles or fraction, or a new Integrated Storage Control -- a hardware "feature" housed within the CPU frame -- will be required for up to 32 spindles on the 158 or 168. On the 145, an ISC for up to 16 spindles (priced at just over half the cost of the 32-spindle version) can be housed within the CPU or memory box; for the 135, IBM has announced a new Integrated File Adapter that can handle up to 16 of the 3330 spindles.

The net result of all this is to lower disk drive prices for System/370, with greater reductions for large users. For a 32-spindle configuration, IBM has effectively lowered its purchase price more than $180,000, or 19%; at the 16-spindle level, this is almost $65,000, or 12%. In either case, maintenance on purchased units will be about 8% less each month.

This arrangement will clearly impact the independent peripheral manufacturers. The new configurations will lead to new engineering (Itel has already said it will be supplying a 16-spindle controller with its 3330 drives) and the largest reductions will affect the very customers who are most likely to opt for an independent drive in the first place -- those with large installations. So IBM's whole scheme adds up to better user prices coupled with an emphasis on more storage and a few more nibbles at the profit margin available to the independent peripheral equipment manufacturers and even independent maintenance organizations.



COST OF IBM 3330 ACQUISITION. Top two lines show prices, for various numbers of spindles, at rental and 24-month fixed-term plan before the announcement. Other lines show effect of Integrated Storage Control, the new 3830-II, and extended-term lease plans announced along with virtual storage for System/370 computers.

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NOW THAT VIRTUAL STORAGE IS THE 'REAL THING' . . .

. . . there's good reason to examine what it is and what it isn't. First and foremost, it isn't new. The ideas have been talked about and played with for years, and by the early 1960s -- nearly ten years ago -- virtual storage was being used, primarily in research-oriented timesharing systems.

Virtual storage allows a computer to directly address many more positions of main memory than it really has. Programmers prepare their instructions as if all the positions of memory were available and the computer, without outside intervention, makes sure all requested information is available . . . swapping "pages" of information from a disk or drum as they are needed.

IBM chose 16 million bytes as the size of its virtual storage for a very simply reason. 370 hardware circuits are designed to handle addresses that are 24 binary bits long, and 2 raised to the 24th power is 16,777,216.

This illusion of vastness carries a penalty, however. Swapping is slow. So large portions of a program -- especially any frequently used sections -- must reside in main memory. And the central processor must know exactly what is where. The Dynamic Address Translation feature -- now an optional extra for the 155 or 165, ready for implementation in smaller models -- does this.

Previously, IBM implemented virtual storage only on the 360/67, although pioneers like Project MAC (and an IBM research center) did it on the 7090. Burroughs has used a type of virtual storage on its large machines since the days of the B-5000 and quietly brought it to smaller users via the 1700. But other major mainframers have steered clear. RCA -- knowing virtual storage was on the IBM drawing boards -- attempted to tout the concept two years ago, but never made the necessary software commitment. Such a commitment is large but IBM has announced it, as the accompanying text explains.

The software side of System/370 . . . a vast commitment

In the initial System/370 announcement, very little new software was introduced; the emphasis was on hardware, with orientation toward online operation. The current announcement (virtual storage) is principally concerned with software, despite substantial hardware "windowdressing." Components of the announcement:

- Four operating systems, each based on prior control programs;
- Job entry facilities for each of the operating systems and for each mode of use -- batch, remote batch, and interactive;
- A major overhaul of data management facilities.

In addition to virtual storage versions of DOS, MFT, and MVT -- called, respectively, DOS/VS, OS/VS1, and OS/VS2 -- IBM has introduced a system control method called Virtual Machine Facility/370 (VM/370). This contains IBM's "Compatible" version of the Cambridge timesharing monitor used with the 360/67, and allows many users to specify an entire virtual machine and operate a terminal as if it were the console of that computer. With this system, small 370s will be able to check out programs designed for implementation on larger models.

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OS/VS1 is available to 370 users now, and was demonstrated on 145s at the time of the announcement. VM/370 and OS/VS2 will be available before the end of this year, and DOS/VS is scheduled to become available in mid-1973. All these systems are supplied to users at no charge, since they are necessary (and will begin the user baptism) for virtual operation. Thus, IBM has backed away from extensive separate pricing of operating systems, as had been expected by some.

How things fit together

To help in assessing "the new 370," EDP/IR once again called in Computer System Architects, a consulting firm in nearby Cambridge, Mass., that assisted in the original evaluation of System/370 on Mar. 24, 1971. Here is a rundown of how the announcement affects the four basic requirements identified then:

Capacity: The new products bring a modest improvement in computing capacity at the top of the line, and somewhat lower prices. More important is the software that makes feasible the use of single systems to handle concurrently a diversity of application classes. One of the most important aspects of the announcement is the incorporation of virtual stored software in system control programs. Because of this, semi-dormant and low-duty-cycle applications such as teleprocessing and remote inquiry don't permanently occupy costly main storage.

Dependability: IBM has dropped the multiprocessor concept, implemented in the MP-65, in which main storage is shared. Instead, it has provided for the sharing of files at the disk storage level (through Hasp). This is a much more "non-volatile" approach, and contributes to dependability with multiple 370s.

In addition, virtual storage permits a smaller processor to back up a larger one in most applications. And all the "new" operating systems are extensions of proven, existing systems with the bulk of code carried over without changes. So software failures will be relatively rare, even at the beginning of use.

Assessibility: IBM summed up its major emphasis here in the second paragraph of the press release, saying that virtual storage "can significantly speed and simplify the development of many computer applications, including remote computing networks and online inquiry systems -- key applications of the Seventies." Remote demands are "floated" in and out of main memory while batch keeps running.

Both Hasp and Power -- bootleg "spooling" subsystems that weren't really in the mainstream of program development at IBM -- have been given Type 1, or prime status. In the case of Power, in particular, IBM seems to have listened; this routine is extremely popular among a large class of disk systems users. And for those who want their own timesharing system, TSO has also been given Type 1 status. So now, a method of operation that was planned only for the very largest of 360s (the 85 and 195) is available to all 370 users who have virtual storage. And as with remote job entry, timesharing will scarcely affect the batch jobstream as it "floats" in and out of virtual storage on system demand.

Evolvability: That's what this announcement is all about; that's why it was extremely important for 370 to be compatible with 360. Users will be able to move from DOS to VS with little trouble. But in the interim, IBM is left having to support six or eight different operating systems. There seems to be a plan for eventual reconciliation, however, and IBM at least seems finally to be tackling the problem that, in retrospect, was considered the most compromised with 360. Implementation might take years, but a single operating system now seems possible.

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Any 360 could execute all 360 instructions, but not every 360 could execute all programs, because programs have incontrovertible main storage requirements. Now, main storage requirements have become virtual storage requirements, so much larger programs can be run on smaller machines. But nirvana has not been completely reached. Some main storage is required for every enlargement of virtual storage, and CSA reminds us that OS/VS2 has so many of MVT's optional features as standard that there's no 135 memory configuration large enough to run it.

More than another access method

On the next-to-last page of one of the two technical press releases IBM put out with the announcement, there is a description of several features "designed for easier and more efficient system operation." One of these was:

> -- A new Virtual Storage Access Method (VSAM) common to all three system control programs, allowing, for example, data files created on a direct access device by DOS/VS to be used by OS/VS1 or 2.

CSA, an expert in programming, thinks Vsam deserves more discussion . . . that it is the most exciting technical aspect of the announcement . . . the one unifying concept that provides the focus for evolution from DOS, MFT, etc. into VS. Vsam exploits block multiplexer multiple request features, consolidates security functions of IMS, and is better aligned to the proper division of labor among computer operators, applications programmers, and systems programmers.

Indeed, Vsam may well be the AM/1 or Universal Access Method that was being talked about in software circles before the announcement. Vsam revamps the data management services of OS, is valuable for online operation irrespective of virtual storage, and represents an enormous software commitment on IBM's part.

In summary

Virtual storage is real . . . planned all along (EDP/IR May 18,1970). Speculation is that the original announcement came a year early to stimulate business during the expected economic downturn; the latest announcement has been delayed, a few months at a time, for almost a year. But IBM's Plan Seventy is now clear.

Users will be encouraged to expand hardware payments to IBM, expecting more than offsetting savings in salaries. (This has been unfairly called a "code sloppy" movement.) And the Industry Giant may have decided to split its emphasis, still seeking rental business but selectively announcing features or software to encourage purchase, perhaps an industry or an application at a time.

There will be immediate effects: The 300 or so 155s and 165s owned by users seem to be left for third-party leasing companies to acquire in sale/leaseback arrangements -- with virtual storage conversion thrown in -- and for independent peripheral companies to outfit. And although purchases of large 370s will diminish until the 158 and 168 are available, the prospect will then be bright for more user purchases, especially since the price is right and IBM is committed.

These changes in ground rules would seem to fit into Learson's implied goal of providing users a good return on investment in a sensible period of time . . . would perhaps remove some of the stiff entry requirements (and antitrust squawks) in a rental-based business . . . could indeed be an economic turning point. All this in addition to the definite focus on virtually infinite computer capacity!

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" AUGUST 28,1972 • VOL.7,NO.20 P.J.McGOVERN,EDITOR

DESPITE 360 RATE EROSION AND VIRTUAL STORAGE ANNOUNCEMENT, THE COMPUTER LEASING INDUSTRY IS ALIVE AND WELL . . . AND LEASING 370s!

Best-kept secret of 1972: Leasing -- risk, full-payout, and almost everything in between -- is underway in the System/370 market. And it's not coming purely from such poetically titled firms as Alanthus and Decimus. Itel, Leasco, Randolph Computer (Travelers Insurance), Bankers Leasing, and other established companies are in there competing for new business.

Most 370 leasing is full-payout or almost-full-payout. As the 370 delivery cycle rolls into full swing, computer lessors -- some of them burned by unexpected 360 rate erosions -- have begun writing a surprising number of leases on the new equipment. International Data Corporation, publisher of EDP Industry Report, expects the value of leased 370s -- processors and associated peripherals -- to exceed $600 million by yearend.

To be sure, 370 leasing on a risk basis isn't expected to bulk so large as did 360 risk leasing; but, so far, there is more activity in both short- and long-term leasing than anyone expected when the 370 was introduced. It takes place amid these currents in the 360/370 marketplace:

- IBM's Virtual Storage (VS) announcement (EDP/IR Aug.15,1972) was not a smash hit among computer lessors. But there were definite silver linings. It slowed 370/155 and 165 new leasing to a snail's pace, and it will force lessors to plunk down $200,000 or $400,000 to add VS capabilities to most 155s and 165s in their portfolios. But 135 and 145 leasing suddenly looks good; IBM salesmen, reminiscent of the late 1960s, are even suggesting this alternative to their customers.

- The 360 used prices and re-lease rates continue to drift downward. Lessors are able to find new homes for their 360 equipment coming off lease, but only through aggressive remarketing efforts and/or rate cuts. Equipment coming off lease will peak in 1973.

- Apropos the above, all the leasing companies have been forced to carefully consider their depreciation policies. Most have made little or no change. But DPF, the biggest 360 lessor in the U.S., took a "special depreciation charge" of $42.8 million for a $34.7 million loss in Fiscal 1972. Controversy over future 360 lease rates, marketability, and accounting principles continues.

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Meanwhile, leasing companies continue to work out new ploys that keep 360s price/performance competitive with 370s. Efforts now, of course, are concentrated on the "price" side of the ratio.

And many third parties are getting into 370 leasing through plans they say are profitable. Piecemeal addition of independent hardware (EDP/IR Jan.29,1971) is now being supplemented by packages which include IBM CPUs, independent tapes, disks, main memories, and perhaps some independent software. So many "deals" are available today that users really have to do a lot of shopping around before they select the plan and vendor they are prepared to live with (box,page 4).

The 370 leasing market

Of the top third-party leasing companies, Itel, Randolph, and Leasco have written a significant amount of leases on 370 machines. DPF expects to do so. Besides these, major 370 lessors are banks (including Bank of America through its leasing arm, Decimus), credit companies, the credit arms of several giant corporations, Alanthus Corporation, and Bankers Leasing (which also handles Diebold's 360 lease base). The market is not so clearly defined as when the "Big Twelve" played in the original 360 game. Some financial organizations are involved purely as a one-shot investment, and it is hard to keep track of all the sources of 370 full-payout leases.

EDP/IR estimates that 370 leases (at original system purchase price) worth $400 million to $500 million are currently in effect. Most are long-term contracts (in contrast to the 360 risk leasing environment), but several firms have written or plan to write operating leases. By yearend 1972, the value of IBM/370 equipment (including some independent peripherals with 370 processors) on third-party lease will be over $600 million; by 1973, it may be over $1 billion.

Besides payout and operating-type leases, there is a third creature that doesn't quite fit either category: the package lease plan. Itel started it by offering a 370 processor with independent peripherals for lease periods ranging from three to eight years. The relatively low cost of non-IBM peripherals pulls down the average cost of the entire system. Telex has a similar proposal, and DPF plans to announce its own package lease in the next 30-to-60 days.

Outside of package deals, lessors are not purchasing many 370 peripherals. Users don't want to commit themselves long-term to disk and tape drives, since these products have shorter life cycles than processors; lessors generally want full payout leases because of the same rapid obsolescence. So about the only "peripherals" where there is still action is add-on or replacement main memory, which can be used throughout the life of the CPU. (A few lessors, however, are wary of independent 370 memories.)

In any event, long-term 370 lease rates to date have held well above rates quoted for 360s in the 1968-1970 heyday of the operating lease. (And for comparable equipment, long-term rates are, of course, below short-term rates.) Lease rates on 370s vary considerably, depending on the particular situation -- period of the lease, escape clauses, mix of independent peripherals, credit rating of the customer, and other such variables.

Shortly after IBM socked-it-to-'em with the anticipated "Smash 7" announcement (the one Telex tried to block), EDP/IR asked several leasing companies what they thought of the new products, including the Virtual Storage software.

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The answers ranged from "What's-the-fuss-about?" to mild dismay, gloating, or optimism. A report by type of machine is the most revealing:

- New leasing of 155s and 165s will slow drastically. Most users are expected to wait for the 158 and 168 or, at most, to temporarily rent 155s and 165s from IBM. There is disagreement on the long-term marketability of the 155 and 165, but lessors generally feel they will sooner or later have to pay what they consider a high price for retrofitting these machines for VS to maintain their value.

- Leasing of 135s and 145s, including risk leasing, will pick up significantly. Since these machines get immediate, free conversion to Virtual Storage -- and since no "138" or "148" were announced -- their long-term life seems assured in the eyes of lessors.

- At least two leasing executives thought that package leases involving independent peripherals would be hurt by the announcement because it would erode confidence in independent peripherals. (IBM has effectively lowered its price-per-spindle for 3330s on the larger 370s.)

- Companies now writing 370 leases probably also will write leases on 158s and 168s . . . some may even write risk leases. But this depends on the actual performance and popularity of the new machines.

- The larger leased 360s will be impacted eventually, lessors admitted, but there is a breathing spell before 158s and 168s are shipped in any quantity. Users may even keep their 360/50s and 65s in longer while they're waiting. Opinions differ as to whether 360/30s and 40s will be impacted by 135s and 145s, now that these models have the new virtual storage capability.

But what about the broad picture -- the overall salability of the Virtual Storage concept and the machines embodying it? The leasing companies displayed a certain ambivilence. Some wondered how many users really needed it; current 155 and 165 users would be particularly put off by having to shut down their machines for the four-to-seven days needed to make a field conversion to VS.

And they pointed out that the 158 and 168 were still unknown quantities. But lessors agreed that IBM had made the commitment; IBM must know what it's doing; and IBM might be able to sell the idea even to users who don't absolutely need it. With Virtual Storage (the concept of the future as well as of the past -- see the EDP/IR Aug. 15 issue) here at last, the longevity of the 370 Virtual Storage machines looks at least as good as that of its original 360 predecessor.

360 remarketing remarks

Keeping those 360 workhorses on lease is a juggling feat leasing companies have accomplished with admirable versatility. Still, there have been some problems -- such as writedowns of equipment value -- and there may be more in the future. It boils down to a simple question: Are leasing companies' 360s really as marketable and valuable as it says on the books? It depends on the actual impact of IBM's and other announcements; on IBM's aggressiveness (indicated by such steps as its Fixed Term Lease announcement, attempted withdrawal of maintenance on 360s with independent memories, and price/performance improvements on new machines); and on the market acumen of the lessors.

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ALL COMPUTERS LEASES WERE DIVIDED INTO TWO TYPES . . .

. . . back in the "early days" of the late 1960s. But today, lease packages run the gamut of the financial imagination, depending on who is writing the lease and what the customer wants. Overly simplified, however, the choice of lease type boils down to whether the user wants long term possession of his computer (seven to eight years), minimum cost, and probably eventual ownership . . . or a shorter term five years down to a year or less for a 360 renewal), more flexibility, and some savings versus IBM rentals. IBM is making its own foray - the Extended Term Lease Plan that provides lower peripheral prices for longer term commitment.

Full payout leases: The financial lease, or true full payout, has the longest term (seven or eight years) and under it the lessor recovers 100% of the cost of the computer, plus interest. It's comparable to a chattel mortage purchase contract or secured loan, and interest rates included in the lease price depend on factors such as the user's corporate credit rating, etc. The machine is usually sold to the user at the end of the period at "fair market value" or it is continued on lease at a nominal rate (usually 2% of original cost per year). Banks, insurance companies, and other institutions write financial leases on a full-payout basis.

Financial leases may be "leveraged" by a bank. Under such a scheme, a bank advances, say, 20% of the computer's cost and "lays off" the remainder with an insurance company. The bank gets its 20% back - for reuse- during the initial period of the lease. Most leases written on medium-to-large machines by banks are being leveraged. Marketing or re-leasing expenses are ordinarily not included in financial lease transactions, since the banks don't maintain computer marketing forces.

Operating or "Risk" leases: Any lease which does not recoup its machine cost and interest on its first term is an "operating" lease with varying degrees of "risk" for the leasing company. The first wave of 370 leases were primarily full payout leases, but there are some new wrinkles in 1972. Here is a rundown on the main classes of "risk" leases now available:

- Operating leases for terms of three to six years were written on 360s, and are returning on the 370. To recover the purchase cost as well as make profits, lessors must extend the original lease or remarket the system -- in whole or in parts.

- Almost-full-payout leases by leasing companies do not actually recover marketing or overhead expenses. These are essentially leveraged leases with a financial institution picking up most if not all of the lease "paper." These differ from a bank's leverage lease in that the period may be shorter, rates somewhat higher, and escape clauses (with early-out penalties) offer the user more flexibility.

- Packaged lease plans now being offered involved IBM central processors and independent peripherals for three to eight years. These plans may provide for upgrade, and be purely risk or limited payout. Depending on the contract, the lessor may recover the cost of the entire system even in a shorter term (because he manufacturers peripherals) or he may recover the cost of the CPU but not the peripherals. Or, he may consider the whole package to be an operating lease.

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During 1971 and early 1972, 360 rates were eroding as 370 deliveries put leased machines on the market, but lessors contacted recently reported that rates seem to have leveled off for the time being.

Both leasing companies and auditors have differed among themselves in their attitude toward 360 depreciation policies. And one lessor, Boothe, switched auditors because of a dispute over the uncertainty of future 360 remarketability. One accounting firm investigating the problem suggested in a letter to its own branch offices that the key issue might be not the useful life of the equipment but rather the ability of the leasing company to re-lease or find an alternative use for the computer!

The hardware sell and the software sell

Up to now the prime technique for bringing 360 price/performance in line with that of the 370 has been to substitute independent main memory for IBM's where possible, and to beef up memory capacity beyond IBM's limits.

A second method has been to offer lower-cost and perhaps higher-performance independent disk or tape in the context of a long-term contract which guarantees the user flexibility to upgrade peripherals and even CPU (see "company notes," below). Beginning in October, Itel will deliver a 3330-type disk drive for use on 360/65s and up. (IBM's 3330 cannot be used on either the 360/65 or the 75.)

But all of these techniques become a little less powerful in light of the lower implied memory cost of the 158 and 168 (versus the 155 and 165) and the decreased cost per spindle on large 3330 disk configurations.

Lessors have begun to talk about another way of toning up 360 performance: independent software. They are primarily thinking of systems software, perhaps even software to provide virtual memory capabilities on the 360. One likely avenue is for lessors to market packages from software houses, as Computer Investors Group is doing with a package from The Computer Company. Leasco has performed a variation on this theme by teaming up with BOAC to provide complete systems for the international airlines industry. Leasco supplies the IBM computer hardware, BOAC its reservation and operations software.

Company notes

This section contains comments on the activities of better and less well-known leasing organizations.

Alanthus Corporation. a New Jersey-based firm evolved from a predecessor company called Efficient Leasing, says it has about $30 million worth of risk and full payout leases on 370s. The most "bullish" of the lessors contacted about IBM's VS announcement, it feels that conversion to VS of 155s and 165s will extend their life by more than enough -- at least two years -- to pay the retrofit costs.

Bankers Leasing administers Diebold's System/360 portfolio, but it does its own full payout leasing of 370s. It will eventually lease 158s and 168s, and will increase leasing of 145s and 135s as a result of the announcement.

Boothe Computer is one of the few very large leasing companies to steer clear of 370 leasing completely . . . when contacted before IBM's announcement, it felt the rental/purchase ratio was too high for anything less than full payout leases.

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DPF Corporation had not done any 370 leasing before IBM's VS announcement, but it plans to lease 158s, 168s, 145s, and 135s. The company told EDP/IR it will announce a package lease for 370s within a couple of months. Like Itel's package, this would involve independent peripherals, but since DPF has no investment in peripherals makers, it would give users a choice of suppliers and type of lease - operating or payment. Also, the company may sign a long-term agreement with a user, offering to lease him a 360 with upgrade either to another 360 or to a 370 processor guaranteed during the life of the agreement.

Decimus Corporation is the dark horse of 370 leasing. It has the simple virtue of being 87% owned by the Bank of America. Formed three years ago by ex-IBM people, it has data center operations in Los Angeles and a contract with Storage Technology to finance tape drives, in addition to its mainframe leasing operation. Decimus has a few, very large clients leasing multiple systems. All of its 370 machines are on "risk" leases with periods of from three to six years.

Diebold wrote $5.8 million worth of 370 long-term leases in 1971 and hasn't stirred in the 370 market since.

First National Bank of Boston is an example of a bank writing full payout leases on 370s purely as a financial transaction. It emphasizes that computer leasing by banks should not be included in the same market as leasing company activities . . . the bank does no marketing or remarketing and simply considers computer leasing as another investment. It also supplied funds to Leasco.

Greyhound Computer, which has the fourth largest 360 portfolio (at original cost), has done only a slight amount of 370 leasing, and that on a payout basis.

Itel has leased about $85 million worth of 370-type equipment on long-term and package leases. Under its well-publicized 370 package lease program, it offers, on three to eight year contracts, IBM 370 processors, Itel disk drives, tape drives OEMed from Telex, and main memory which it markets exclusively for Advanced Memory Systems. On a five-year contract, the package might lease for 60% to 85% of IBM rentals, with lower rates for packages heavy on non-IBM peripherals.

Itel will also lease 155s and 165s that are converted to Virtual Storage machines, either as part of a package or separately. One target is 155 and 165 owners who need more memory. Itel will offer to buy their machines, install the VS retrofit feature, add AMS main memory, and leaseback on a five-or-more-year contract. It reasons that users would like to avoid shelling out another $200,000 or $400,000 to update their computer (having purchased it so recently) and that users already have made the long-term committment to their 370 model.

Itel has also applied the package concept to 360 leasing; last March it wrote an eight-year "lease" with Beckman Instruments . . . the contract was essentially an agreement to do business for eight years, and it left Beckman with great flexibility in upgrading to a 370 CPU.

Leasco says, very emphatically, that it has no trouble remarketing 360s and, in fact, has more users than it can satisfy. Already strong in the European market, Leasco recently obtained orders from Russia and Poland for System/360 machines; its agreement with BOAC to supply hardware and software for the international airlines industry was described earlier. The company leases 370s only on a long-term basis, and has approximately $40 million worth on lease. Following IBM's VS announcement, it may begin to lease 145s as well as the larger machines.

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Randolph Computer is the first major leasing company to engage in 370 risk leasing. With IBM's Virtual Storage unveiling, Randolph will start writing three-year leases on 135s and 145s, but not on the larger machines. One clue as to why Randolph stepped in where DPF, Boothe, Itel, etc. held back is that it has financial backing as a subsidiary of Travelers Insurance. To strengthen its 360s, Randolph is actively marketing independent memories from Cambridge Memories and Electronic Memories and Magnetics.

Telex leaped into the leasing game in June when it formed a Leasing Division, headquartered in Phoenix, to lease 360s and 370s. It has a package lease similar to Itel's, with an IBM processor and Telex tape drives, Itel disk drives, and Telex main memory. Telex capitalized on the Virtual Storage announcement by offering to guarantee an upgrade to Virtual Storage for 155 and 165 lessees at no extra cost, under its package plan. So far, it has firm orders for about $6 million worth of 370 CPUs and compatible peripherals on a payout basis, as well as several 360 systems on lease.

NICHE FOR INDEPENDENT MAINTENANCE SEEMS SECURE . . .

When IBM's System/370 computers were announced, increased maintenance rates reflected the higher labor costs involved, it was thought, and pointed the way to a possible new area of business (EDP/IR Jan.29,1971) . . . especially since sites and entire networks with mixed arrays of equipment were growing in popularity. This concept seems to be proving valid, even in light of an IBM price cut.

. . . for systems

In the original announcement, IBM's maintenance charges for CPU and main memory were pegged at about 9% of monthly rental for the 135 and 145, and ranged between 10% and 11% for larger models. A few months ago, however, IBM reduced these to about 7% and 9%, respectively, based on field experience. Few customers ever paid the higher rates, because purchased systems carry a one-year warranty.

And this trend apparently is expected to continue on the 158 and 168. Comparable maintenance rates for CPU and memory are only 5% to 7% the monthly rental, not much above the 3% to 5% charged for System/360. But this is no worry to the independent maintenance people, especially since rates on peripherals tend to run much higher. Comma Corp., started in 1970 by ex-IBM field engineers, points out that maintenance is only 4% of an organization's DP budget. "We're selling a higher skill level," the company's president says. "Any price advantage we offer the user is frosting on the cake."

Frosting or not, the company is doing all right. So far it has maintenance personnel servicing some 450 computer systems owned by their users or leased from a third party. Use of Comma is up to the individual customer, but most of the major leasing companies have agreed to allow Comma to maintain their 360s. And the company has high hopes for business in the future, since it forsees a significant level of purchase activity. It will begin maintaining these systems as soon as the first year of IBM maintenance under a purchase contract expires.

This same attitude is held by Computer Sciences Corp., which cut its teeth in maintaining computers for the Federal Government. In addition to providing maintenance, CSC is also in the facilities management business. Often, third-party maintenance can be its introduction to a computer site, with a facilities management contract coming later on.

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And there are other signs that third-party maintenance is becoming a bona fide part of the computer marketplace, small though it still may be. Recently, the Navy announced plans to buy independent maintenance services for 15 IBM CPUs (all 360s) and 462 tape and disk drives made by independents. The locations of this equipment range from metropolitan Washington D.C. to Barstow, Calif., in the middle of the Mojave Desert. Some Federal contracts may include non-IBM mainframes, and at least one company (located in Univac's home town of Blue Bell, Pa.) specializes in the Univac 1100 series machines.

In the news, also, are actions by two large corporations, proclaiming much louder than words their faith in the potential of computer maintenance:

- Last month, GTE Information Systems established its Service Division, with over 500 field engineers, as a separate corporation. In addition to maintaining its own equipment, GTE has contracts with several small peripheral manufacturers . . . and talks about capturing a large segment of the third-party service market.

- Control Data has signed a definitive agreement to acquire Syntonic Technology (which had revenues of $6.5 million in its Fiscal 1971) through a stock swap. Syntonic entered computer maintenance from non-EDP electronic equipment maintenance and is out to service single products or entire systems.

Indeed, organizations with data base inquiry networks or other types of terminal-oriented systems may prove to be prime customers for many of the third-party maintenance firms. Users who set up such networks often select equipment from several different suppliers, and therefore want the unification and system security that a single maintainer can provide.

Such network maintenance, of course, can be supplied by IBM or the other major mainframers. But such a choice by a user precludes a certain amount of system selection flexibility. But the prospect of this type business is available to third parties only if they have a nationwide organization, or at least one that operates in the cities where the customer is. And providing such network maintenance requires a good knowledge of communications as well as specific products. These factors require the independent to have a certain size and skill level, but the market is one that will mushroom during the next few years.

. . . and for independent peripherals

In the meanwhile, a multitude of independent peripheral suppliers have signed contracts directly with outside service organizations. This makes for a lot of contracts, but few of any size. To name some . . .Honeywell tends installations for Data Recall (add-on memories) and for Data 100 (high-speed terminals), among others. SirVess (New Jersey-based, operations begun in 1969) has contracts with a number of smaller peripheral firms as well as users of mini-based systems. Syntonic (soon CDC) maintains Hazeltine CRTs in addition to other EDP, communications, and medical electronics equipment. GTS's customers include Logicon, Vogue Instruments, and I/O Devices. Sorbus, Management Assistance Inc.'s old service division, has signed about 20 independent vendors, including Fabri-Tek and Data Recognition.

And so it goes. There seem to be definite trends toward mixed systems, large system commitments, and more outright purchase as we move into the 1970s. These could mean more independent maintenance business . . . perhaps more businesses.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" SEPTEMBER 15,1972 • VOL.7,NO.21 P.J.McGOVERN,EDITOR

How to look at a mixed picture

EVEN IN ITS LEADERLESS ENVIRONMENT, COMPUTER SERVICES CONTINUES A 20%+ ANNUAL GROWTH ALONG MANY DIVERSE PATHS

Computer services is the second largest and fastest growing of the six computer industry segments identified by EDP Industry Report. And during the next five years, revenues for this sector will more than double, from almost $1.5 billion in 1971 to an estimated $3.9 billion in 1976 (EDP/IR Mar.30,1972).

But even though services is a real growth area for the 1970s, it's quite unlike much else in the computer industry . . . it's full of incongruities . . . it seldom has normal economies of scale. For example, it's:

- Leaderless. IBM accounts for only 5% of the $1.5 billion revenues, GE ranks a close second, and the top ten entries scarcely generate one-fourth of the total.

- Heterogeneous. Composed of a hundred or so types of businesses rather than one or even ten, this industry sector has a whole different set of economic and financial considerations.

- Diverse. Many major service entries are new to the computer business, companies such as Boeing, McDonnell Douglas, Westinghouse, and Western Union; much of the pace is being set by a new breed of small specialists such as CARS, Keydata, and National Data.

What's more, many of the participants have profit pictures streaked by red. During the last year, profits have been achieved. But, ironically, in many cases they are the result of restraints on expansion imposed by the economic downturn. According to a recent Adapso study implemented by the International Data Corporation, publisher of EDP/IR, 72% of software and services industry participants showed pre-tax profits during 1971. The study is currently available from IDC and a summary of results will be reported in EDP/IR shortly.

But before it examines the Adapso report or various computer service industry aspects, EDP/IR believes a common ground for discussion is needed. This sector has been difficult to discuss in the past because it is surrounded with terms that mean different things to different people. So for the second time in its eight-year publication history, EDP/IR turns to definition to eliminate confusion.

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TIMESHARING RELIES ON RAIR . . . BUT RAIR ISN'T ALL TIMESHARING

FOUR YEARS AGO, EDP Industry Report decided to zero in on what then was considered the "coming thing" in computer utilization -- timesharing, on-line/real-time systems, remote computing -- "whatever you want to call it," we said in August, 1968. At that time we elected to coin a new word -- RAIR -- to describe remote access/immediate response interaction with computers.

Acknowleding even then that word coiners are often the bane of existence in the information processing industry, we have stuck by our guns and continued to use "rair." Some in the industry have joined us, others have nodded, "Oh! You mean timesharing." Well, no. That's not all we meant or mean. Timesharing is a subset of rair; by the definitions presented in this issue, T/S is the provision of raw computer power in an interactive or rair manner.

What is rair? It is a method of computer access, differentiated from the two other methods, batch and remote-batch. Many of the ideas behind rair computer operation came from the Air Force's Sage System, developed to a large extent by members of the technical community that orbits around the Massachusetts Institute of Technology. In 1959 or 1960, technical papers by members of this community talked about the advantages of such systems; and by the early 1960s, prototype systems for other uses were demonstrated.

Most of these early systems, quite naturally, provided interactive remote access to a computer's power, since that's what the scientists needed. And one of them, J.C.R. Licklider, became the early "hero" if not the "father" of timesharing after he joined the Advanced Research Projects Agency and secured funding for several experimental systems, including the largest and most publicized of the pioneering systems, Project MAC at MIT.

During the same period when MAC was developing its timesharing system, a commercial (but true timesharing) system was begun by Bolt Beranek & Newman, the Cambridge, Mass. firm where Licklider had worked when he prepared his early papers on the subject. During the same time period (1963ish), experimental work was begun at Dartmouth College (by a team including the school's current President, John Kemeny), where the almost-standard Basic language was developed so that students could begin using the computer in their problems.

But other activities, considered "different kinds of timesharing," were going on at the same time.

- The Sage (for Semi-Automatic Ground Environment) System started IBM researchers thinking about the possibility of a Sabe (for Semi-Automatic Business Environment) System. This led to American Airlines' Sabre system and looms behind many other reservations and rair data base inquiry systems of today.

- MIT researcher Charles Adams, who had worked with Sage and the associated Whirlwind computer project during which the core memory was invented by Jay Forrester, applied these concepts to business in a different way. This led to Keydata, still the best-known example of a rair transaction processing system.

Thus, "rair" is a computer access method for which the word "timesharing" was long used; EDP/IR considered this use incongruous and coined the word, rair.

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This confusion began almost as soon as the communications and computer disciplines met on the common ground of computer services during the mid-1960s. Before the last decade wound down, EDP/IR was forced to coin a term -- rair (see facing page) -- that explained one type of computer access method . . . remote access/immediate response. This concept helped put "timesharing" into perspective.

Now, for the 1970s, IDC has been forced to go further . . . not with a definition per se, but with the construction of a compact matrix that relates access methods (batch, remote-batch, and rair) with the ways in which people use a computer. Once identified, this matrix allows a more precise discussion of what should properly be called the computer services industries. Within this framework, the reader can more readily see why successful service companies must concentrate on doing one thing well . . . why companies stressing service have a better prognosis than those stressing computer . . . and why the forecast for this entire collection of businesses called the computer services industry is expected to grow at "only" a 21% compound annual rate over the next five years.

So this discussion is concerned more with ideas than with specifics. This approach is considered necessary for the reasons explained above. But it is perhaps even more important because this is an industry of ideas. Projections given in this issue are based on the best information available. But they could miss by more than usual because of the nature of the developing industry.

If creative people continue to apply computer/communications technology to new ideas, the growth rates presented here could well be low; if, for some reason, such creativity were withdrawn, a more "normal" 15% growth might result. Never, in its short history, has the computer industry been in a better position to capitalize on the talent its participants -- old, new, and as yet unidentified -- possess.

Two distinct paths

In the adjacent dissection of computer services, there is talk of two different elements: access method, and the computer's use.

- Access method: The user of any service being discussed in this issue must interact with the computer in some manner. It could be batch, in which he has no direct communication with the computer; remote-batch, in which he interacts with the computer to set a process into motion but then walks away until the job is executed; rair (see page two) in which he interacts during the execution of a job.

- Computer utilization: From the computer's point of view, the service provided can be raw power or calculation in which the user specifies exactly what is to be done and is billed for the computer resources used; it can be a transaction service in which the computer updates a user's master files, as specified, with software from the vendor; or it can be a data base inquiry service in which the user takes advantage of a data base and manipulatory software supplied by the vendor.

The combinations of access method and type of computer use, shown on page five, gives nine diffent types of computer service. These will be discussed shortly. Lest the reader start to rebel at such a segmentation, we should point out immediately that all of the businesses offering one or more of these nine types of computer service really divide into two distinct groups, those with emphasis on computer and those with emphasis on service.

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- Computer service firms supply raw power. There is room for profitability in this business, especially for companies that offer different access methods and/or a wide variety of properly priced "chunks" of power. A company willing to stress raw power and a distribution network for it -- such as McDonnell Douglas Automation that wholesales time to other service companies -- can become a significant force in the industry and make a profit. But outside the network operators, and a few geographically specialized timesharing carriers, a proprietary service of some kind seems necessary for consistent and increasing profitability.

- Business or consumer services built around a computer's capability provide such a proprietary ingredient. It is these companies that, according to IDC forecasts, will experience rapid growth with profitability. This has not been the trend in the purely computer service portion, and it appears that prospects for profitable growth will continue to elude most of the companies that specialize simply in raw power.

These generalizations should be kept in mind in examining the computer services matrix (opposite page). And in the discussion of the matrix cells that follows, it will be clear why "Do one thing well" is the advice that seems to always rise to the surface.

A look at the inner cells

The concepts, the growth potential, even the individual participants in the computer services industry vary greatly. Here is a runthrough of the industry as it breaks down according to the matrix on page five:

■ [] [] BATCH RAW POWER is seldom a specialty of the house. When it is, it usu-
[] [] [] ally is supplied by a company operating, for example, a medium-sized
[] [] [] 360/50 in a large city. (Individual users selling second or third-shift excess time are not included in computer services.) Most frequently batch raw power is sold in conjunction with other computer services, and there is little or no growth potential remaining for this sector. Small, in-house computers such as the System/3, large users selling excess time, and remote-batch raw power offerings (below) will cause revenues in this sector to drop from the $100 million level of 1971 to about $80 million by 1975.

[] ■ [] REMOTE-BATCH RAW POWER services, generating about $100 million in revenues
[] [] [] today, will be a different story. A tripling of revenues by 1975 is con-
[] [] [] sidered likely. In addition to the three large remote-batch specialists -- UCC, CDC, and McDonnell Douglas Automation -- several smaller companies such as Sci-Tek, Systems Dimensions Limited, and United Computing Systems receive a large part of their business from this area. In addition, quite a few companies already see their revenues split between this category and rair raw power. Interestingly, much of the revenue gains in this sector will not accrue to present participants. More and more, timesharing suppliers will be moving into remote batch operations (to smooth out the load demands of their business) and they will siphon off some of the expected increase in revenues.

[] [] ■ RAIR RAW POWER is popularly called timesharing (see page two). Over 100
[] [] [] companies participated in the $185 million revenues chalked up in this
[] [] [] area last year, but most of them are small. The largest two are General Electric and Tymshare; IBM, National CSS, and Rapidata are also significant.

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COMPUTER SERVICES, as defined by the International Data Corporation and discussed in this issue of EDP/IR, are all those:

+ Operated for the benefit of more than one customer; and

+ Priced primarily on the basis of computer/communications resources.

Premiums may be charged for special software or data bases; the computer's transparency does not matter. Such consumer-oriented services as reservations and ticketing are included because the computer is a predominant cost factor and a virtual necessity. Excluded are education, software development, systems consulting, facilities management, and leasing. These are either manpower intensive or provided for a single customer.

The industry, then, can be looked at from two distinct points of view, each of which can be broken down into three elements:

+ From the user's point of view, by access method -- batch, remote-batch or rair (remote access/immediate response);

+ From the computer's point of view -- raw power or calculation, transaction processing, or data inquiry/table lookup.

The combinations of these elements can be arranged as a 3x3 matrix with nine distinct cells. These are shown below with the 1972 growth expectations for each; in addition, the matrix is used throughout this issue in describing the computer services industry.

	Batch	Remote-Batch	Rair	Totals
Raw Power	-5%	35%	26%	20%
Transaction Processing	19%	50%	90%	22%
Data Base Inquiry	20%	100%	24%	26%
Totals:	17%	40%	33%	22%

During the last year or two, most of the timesharing vendors have limited their own growth in the interest of profitability; for the short term it has worked. Company after company is announcing its shift from red to black ink. Despite this, there are fundamental questions about ongoing consistent profitability for companies that specialize in timesharing only. Too many suppliers have similar services and, therefore, few locks on customers unless specialized software becomes the product actually sold. Most large rair raw power users today deal with several vendors . . . not for any unique offerings, but simply to play one against

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the others and be certain of latest developments. A customer may be profitable for one of his vendors, but he tends to place extra demands on all. This requires excess hardware, larger networks, and overcapacity.

[] [] [] BATCH TRANSACTION PROCESSING accounts for over 60% of all computer ser-
■ [] [] vice revenues, and the hordes of small service bureaus are concentrated
[] [] [] here. Of 1971's slightly more than $1 billion of batch service bureau business, about $140 million was done by the top five companies, another $150 million by the next 25, and the remainder -- about three-quarters of a billion dollars -- by some 1250 small firms. This area will growth about 15% a year while the total services market is growing at more than 20% a year through 1976. The payroll service offered by Automatic Data Processing is probably the best-known example of a large company in batch transaction processing. And the company's philosophy, stated in its 1971 annual report, shows that it understands what it is doing. "ADP has avoided the more esoteric aspects of the computer services field, concentrating on the basic record keeping needs of the businessman . . . " It adds: "While ADP is expert in computer technology and equipment, its primary product is a combination of knowledge and the ability to perform. This knowledge of a particular field enables ADP to provide its clients with current and usable information."

[] [] [] REMOTE-BATCH TRANSACTION PROCESSING is a small part of the services busi-
[] ■ [] ness, accounting for only 1% or 2% of current revenues today but promis-
[] [] [] ing growth that averages 50% a year. Probably the best-known company in this area is Computerized Automotive Reporting Service a company that helps automobile dealers with inventory, accounting, and leasing transactions. CARS, interestingly, doesn't operate its own computers. It prepares and maintains software, handles marketing and service, but retails computer time and communications links acquired from McDonnell Douglas Automation.

[] [] [] RAIR TRANSACTION PROCESSING accounts for about twice the revenues of the
[] [] ■ remote-batch variety described above, and will grow by 45%, almost as
[] [] [] fast. Indeed, in many applications rair and remote-batch transaction processing may well be blended -- for time and task load balancing -- with actual revenues from each somewhat difficult to break out. Keydata -- with its invoicing system for wholesalers and small manufacturers -- is probably the best-known service of this type. A testimony to the fact that Keydata really understands its customer's business is that the customer is generally on-line to the system all day and truly uses it as an integral part of his operation. Weekly and monthly reports, however, are generated at night in batch or remote-batch mode.

[] [] [] BATCH DATA BASE INQUIRY accounts for less than 2% of services revenues
[] [] [] and this isn't expected to increase greatly, with growth pegged at 15%
■ [] [] a year; on-line is definitely the trend in all service operations. An example is Chilton Corporation's consumer credit checking operation. Clients make inquiries as to an individual's credit rating and also provide the inputs that keep a person's file up to date. Thus, Chilton is a clearing house, collecting and distributing data for member firms.

[] [] [] REMOTE-BATCH DATA BASE INQUIRY is the smallest of the nine cells defined
[] [] [] by the matrix, but should grow at more than 40% a year, on average, over
[] ■ [] the next five. One of the best-known examples today is the Westat service that operates over Control Data's Cybernet network. It provides subscribers access to the official U.S. Census data; analyses can be performed using the Censtat programming language.

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[] [] [] RAIR DATA BASE INQUIRY is quite common today, and will grow at more than [] [] [] 40% a year between now and 1976. Bunker Ramo operates the Telequote stock [] [] ■ quote network giving brokers access via their own desktop terminal to the latest prices of listed stocks. More recently, the company has implemented NASDAQ for the CTC markets, providing both brokers and market makers the ability to inquire and in some cases set quoted prices of these stocks. International Reservations maintains inventories of hotel rooms it can confirm via a telephone call from the traveller. Ticketron sells access to entertainment from terminals distributed throughout many cities. Interactive Data Corp. provides financial data on public companies and provides a special-purpose language for its manipulation. Realtron tells real estate agents what homes are for sale; Telecredit Corp. maintains records of persons known to have passed bad checks at member stores. The future of these services is as vast as the imagination of data base compilers . . . but each has different characteristics, different markets, and must be sold a different way.

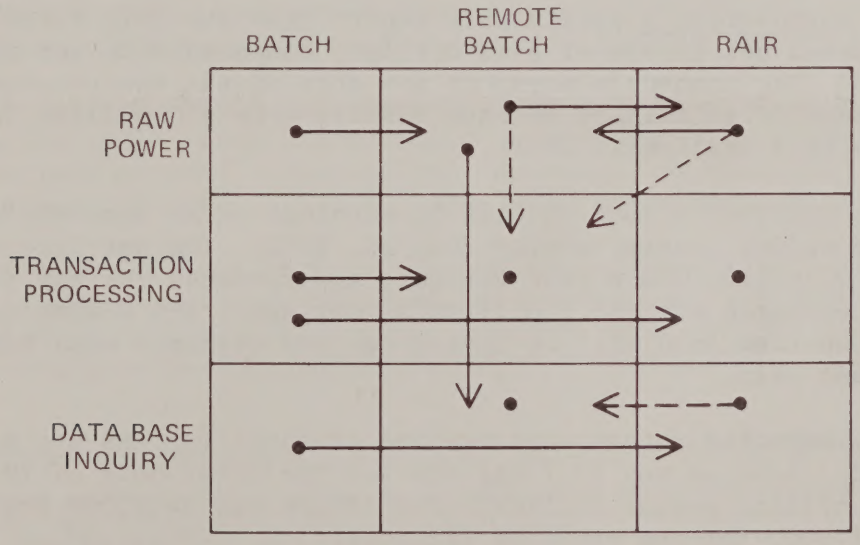
Where do things go, and how?

Certain generalizations about computer services growth can be made, based on the preceeding discussion of cells in the matrix. The diagram below suggests these important lines of development for the service industry:

- Movement (across the matrix rows) in the direction of more immediate access. This involves simply a change in the computer access method and perhaps some new or different hardware. The application remains the same.

- Addition of remote-batch access to rair services. By doing this, a computer service can move some of its demand into non-peak-time (overnight, for example) periods and accomplish more work without increasing the total amount of hardware needed.

- Expansion of remote-batch services into more applications areas. Since each job entered from an R/B terminal can be essentially self-contained, a variety of services is easier to offer. This will be especially true as service bureaus begin to take advantage of equipment -- such as the virtual storage IBM/370s -- designed for operation in an on-line environment.



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A few other types of movement can surely be found among the many diverse companies in the industry, but it seems patently clear that expertise in running a computer system is not the significant factor among the companies in this sector.

In other words, the computer services industries are primarily dependent on services -- knowing the customer and giving him what he wants -- for their success. Thus, as this industry grows, the computer technology that allows it to exist becomes almost incidental. To be successful, most companies are forced to specialize -- to do one thing well -- and are forced to examine economic considerations different from those common in many other segments of the computer industry. Computer services is the sector that blends the computer industry into almost every aspect of business, and it's where the action is.

SERVICE COMPANIES REPORT THEIR EARNINGS

Several of the computer services companies mentioned in this issue have recently reported earnings. Following are highlights of the reports:

Computerized Automotive Reporting Service, Inc. (CARS) reported revenues for the first half of 1972 of $3.1 million, up from $2.3 million last year. Earnings were also higher, at $145,000 as compared to only $39,000 last year. CARS pointed out that its revenues are closely tied with the level of activity in dealerships subscribing to its services; it expects the auto business -- and thus its revenues -- to remain strong for the rest of 1972.

Keydata Corporation showed a gain in nine-months figures over last year. For the nine months ended April 30, 1972, revenues were $5.4 million, compared to $4.4 million last year. Net earnings before taxes and non-recurring income were $98,000 compared with a loss of $91,000 a year earlier. Net earnings after taxes and the non-recurring income (from sale of publications and from a licensing agreement) were $185,000 for this year, versus $2,000 last year.

National CSS, Inc. said in its first quarter report, for the three-months ending May 31, 1972, that it "achieved a strong start on fiscal 1973 operations." Revenues were $3.8 million, up 49% over the $2.5 million of a year earlier. Net income (after taxes and extraordinatry credit) rose to a new quarterly record of $281,000 compared with $92,000 a year earlier.

National Data Corporation's preliminary report from its 1972 fiscal year ended May 31 indicated net income of $1.3 million, compared with net income of $523,000 a year ago. The company's earnings are free of tax due to accumulated tax loss carry forward. Preliminary revenue results were $10 million for the year, compared with $6.7 million in 1971.

Tymshare, Inc. reported a jump of 112% in earnings on an increase of 21% in revenues for the second quarter ending June 30, 1972. The net income was $225,000, compared with $106,000 a year earlier, and revenues for the quarter were $3.8 million, compared with $3.1 million a year ago. Six months revenues were $7.3 million, up from $6.0 million a year ago and earnings were $335,000, up from $229,000 last year.

Rapidata, Inc. reported record earnings and revenues for the six months ended June 30, 1972. Revenue was $3.7 million for the first half of 1972, compared with $2.6 million a year earlier. Net income was $453,000 for the period, up from $317,000 for the previous first half.

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EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" SEPTEMBER 25,1972 • VOL.7,NO.22 P.J.McGOVERN, EDITOR

Adapso survey summary inside

BANKS SELL $764 MILLION OF COMPUTER SERVICES IN 1971; INDEPENDENTS LIST THEM AS PRIME COMPETITIVE THREAT

Two computer services studies completed this summer by International Data Corporation, publisher of EDP/IR, fit together very nicely. One is the annual computer services survey, sponsored by the Association of Automatic Data Processing Service Organizations (Adapso); the other is a report on bank data services.

IDC found that about 1900 bank sites have squeezed into the data processing services market, garnering $764 million in revenues during 1971, compared with the $1955 million total for independent service firms plus banks. Adapso's survey (reported later in this issue) tells the other side of the story: independent service firms see banks as one of their most important sources of competition.

Over a year ago the Federal Reserve Board decided that all bank holding companies may offer DP services to the public; before that, only one-bank holding companies and single banks had been allowed to market these services. The Board's press release dated June 15, 1971, stated:

> The Board of Governors of the Federal Reserve System announced today an additional amendment to its bank holding company regulation outlining the type of data processing activities permissible for bank holding companies under the 1970 amendments to the Bank Holding Company Act.
>
> . . . Under the amendment, bank holding companies will be permitted -- subject to Board approval in individual cases -- to process banking, financial, or related economic data for any type of customer.

Thus, the cast of players in the data services market was set, and it was to include the nation's banks. It suddenly became important to understand the "automated customer service" offerings of the banks. What is their growth potential? Who, if anyone, do they threaten? Are banks price cutters, or price raisers?

International Data Corporation contacted 50 users of banks and independent computer services and over 200 banks in order to get the answers. Results of the study, summarized in this issue, provide important insights into this controversial sector of the computer services industry.

EDP Industry Report and Market Review is published twenty-four times each year by the International Data Corporation, 60 Austin Street, Newtonville, Mass. 02160. Entire contents © 1972 by the International Data Corporation. James Peacock, Managing Editor; Carol Chapman, Jack Colantino, Nancy Scull, Associate Editors; C. Oakley Mertz, Research Analyst; Arthur Whelan, Circulation Manager. Patrick J. McGovern, President, International Data Corporation; William Leitch, Vice President/Subscription Services; Walter Misdom, Vice President/Industry Analysis. Editorial ideas and information are collected from numerous industry experts, and are researched and formulated by members of the editorial staff. The information and opinions contained in each issue are based on the best information available, but their accuracy and completeness cannot be guaranteed. Subscriptions: One Year, $95. Single copies, priced as indicated on inside pages, airmailed same day requested. Prices for multiple copies available on request. Telephone (617) 969-4020. Reproduction without written permission is completely forbidden.

Banks swell computer service ranks

At the end of last year there were about 2500 bank computer sites. IDC estimates that over 75% of these are currently providing computer services to business depositors and/or correspondent banks. The percent will become even higher as more banks implement plans to enter this market. As the table below shows, large banks are the most likely to enter the market, but even small banks have a good representation.

BANK COMPUTER SERVICE OPERATIONS, BY DEPOSIT SIZE

Deposits	Current (5/72) Percent	Current (5/72) Number	Planned (by 12/73) Percent	Planned (by 12/73) Number	Total* Percent	Total* Number
Under $100 Million	76%	1,324	6%	105	100%	1,744
$100M to $1 Billion	82%	498	6%	35	100%	607
Over $1 Billion	92%	73	7%	5	100%	79
Total	78%	1,895	6%	145	100%	2,430

*All bank sites with computers

In the past, banks would implement any and all applications for their business clients; but now, most are looking only for generalized applications suitable for large numbers of customers. They shunt unwanted jobs off to their independent service firm competitors. (They'd much rather the business go to an independent than to another bank, which might steal the depositor altogether.)

Batch payroll processing now accounts for the large majority of bank DP services, and, in the future, most banks will stick to this area, except perhaps for limited expansion into other accounting applications such as receivables, payables, and general ledger. A few plan to move into inventory control and production control as well. Correspondent bank services most frequently include checking and savings account applications and trust, loan, and mortagage accounting.

Scant profits

"Profits have been quite elusive, indeed, almost unheard of, in the U.S. banking computer service marketplace." So states International Data Corporation's report. It's fortunate, therefore, that banks have another good reason for offering these services - to attract and keep depositors. However, bank managers have begun to look more critically at their customer DP services in order to put them onto a profitable basis.

Banks organize and offer their services in several ways. These range from maintaining automated customer services as an operating department of the bank (at 68% of sites) to spinning them out as a subsidiary, forming a joint venture with other banks, or teaming up with a facilities management firm (such as the Texas-based National Sharedata). In some cases, banks even market services performed by an independent, Automatic Data Processing. ADP says over 100 banks of various sizes have come to it for assistance.

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Competition in bank computer services

Banks see as their primary DP service competition other banks, who threaten to lure away depositors as well as computer service clients. Independent service bureaus run only a poor second as a competitive threat. Most banks and their data processing customers view price as the key factor in selling computer services. But as banks become more established in the services market, they build customer loyalty. This has allowed some to raise prices above the industry average and still keep most of their customers.

IDC's questioning turned up an interesting sidelight: many customers feel they are getting an education from their bank DP services. After a stint as a services customer, they will strike out on their own with an in-house system. Thus, the bank is guaranteed some customer turnover. Its problem is to keep clients during the whole educational process, rather than losing them when "partly educated" to another bank or independent service bureau.

Prognosis

In its study, IDC predicted that bank computer service revenues would rise from 1971's $764 million to $1.8 billion in 1976. What types of services do the totals represent for 1971? How will the service mix change in five years?

BANK COMPUTER SERVICE REVENUES, 12/71

	Batch	Remote-batch	Rair	Other*
Raw Power	$69M	Neg.	Neg.	--
Transaction Processing	$550M	$38M	$38M	$69M
Data Base Inquiry	Neg.	Neg.	Neg.	--

*Media conversion, terminal equipment rental, etc.

Most banks will stick primarily with payroll processing, but a few will venture further afield. The above matrix describes the current breakdown of the bank computer services market (see EDP/IR Sept.15,1972 about this format). Batch transaction processing will be the largest area in 1976, as it is today. However, its growth rate will be lower than that of services as a whole. Remote batch and interactive transaction processing will significantly gain share, while at the opposite extreme batch raw power practically stagnates.

All these forecasts could be substantially altered, if new regulations or laws prohibited banks from offering services to the public. The Comptroller of the Currency is preparing a report on bank data processing services. But even if the study results in restrictions on bank computer service offerings -- and there's no guarantee it will -- the restrictions would apply only to national banks, under the Comptroller's jurisdiction. The Federal Reserve would have to follow suit with its own ruling in order to affect banks using the holding company structure. But whatever the final outcome, for the time being banks may keep on marketing their DP services, contending only with their competition, computer service economics, and their own operating structures.

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ADAPSO STUDY FINDINGS

The place to make a profit in computer services is batch processing. That is one of the conclusions of the Sixth Annual Industry Survey sponsored by Adapso (Association of Automatic Data Processing Organizations) and prepared by International Data Corporation, publisher of EDP/IR.

A survey of 215 services firms, including revenue data from 122 respondees, revealed that whereas 83% of the "batch" firms showed a profit in 1971, only 45% of those involved in on-line processing, or which offer a significant amount of facilities management or software in addition to processing services, reported a profits for 1971. The pre-tax profit average for the sample was +5.6% of sales.

The survey, it should be emphasized, had particularly heavy response from small and medium sized firms, with about half the total returns coming from shops with less than 25 employees. Also, as with the last Adapso survey (EDP/IR Aug. 18,1971), banks, universities, utilities, government agencies, and companies specializing in software, facilities management, and training were excluded from the study. Independent computer services firms and manufacturer-owned service organizations were included.

Problems

Competition is the number one headache for service firms contacted. Not just any old competition . . . competition from other computer service companies (mentioned by 31% of respondees), banks and insurance companies (27%), computer manufacturers (19%) universities and government agencies (11%), and other computer users (10%).

Not all the competition is from computer services. Small business systems (e.g. System/3) and minicomputers are also threats.

The second-ranking concern of service firms is "image." The industry believes itself bugged by poor management, lack of credibility, lack of professionalism, and under-capitalization. As usual, the cost and reliability of data communications came in for a drubbing, and "personnel" again made the list of perennial peeves. The cost and competency of people were the main gripes, while unionization of DP employees also came under fire, as did training schools.

Then, there's always someone who sums up the difficulties: "Making Profits, Keeping Customers Happy, and Getting the Product Out on Time."

That all important customer list

The above-quoted firm might have just said, "Keeping customers . . . Period." Repeat business is the key to success in almost any market. Therefore, the Adapso questionnaire asked reasons for gaining and losing customers during 1971.

Answers reflect the service firms' acute awareness of what they did last year to win clients. Few mentioned the general level of activity of the market as a helpful factor. Instead, new services, sales and marketing, referrels, reputation, and software were all credited with attracting customers.

A fair number of companies blamed "slack business" or the customer going out of business for losses. But by far the biggest villains were in-house systems.

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Services offered

Since companies in the Adapso study felt new services were an important factor in getting customers, it is interesting to see just what services the firms now offer or are planning for the future. According to the study, "Diversity of function is a genuine characteristic of the service industry." While payroll, accounts receivable, billing, and accounts payable processing are very important money-getters for most service suppliers, few stick solely to processing one application or just to "processing" itself.

DISTRIBUTION OF REVENUE-PROVIDING SERVICES*
(Percent of firms responding)

Service	Yielding revenue Now	Planned	Service	Yielding revenue Now	Planned
Processing:			Input/output:		
Accounts payable	44%	15%	Keypunching	42%	--
Accts. receivable	63%	11%	Key-to-tape/disk	2%	9%
Billing	46%	15%	Optical scanning	4%	3%
Payroll	67%	10%	COM	1%	3%
Other - 1	87%	3%	Other	4%	--
Other - 2	39%	--			
Software:			Other services:		
Standard packages (devel. inhouse)	2%	9%	Installation mgt.	8%	10%
			Equipment leasing	5%	6%
Standard packages (devel. outside)	26%	9%	Inhouse time sale	17%	3%
			Outside time sale	11%	2%
Custom packages	28%	3%	Recruiting	1%	1%
			Training	6%	3%
			Other	7%	--

*Based on Table 24 of the Adapso survey

The table above shows what other services the respondees offer besides data processing. They provide data entry services, they sell computer time, they prepare custom software, they provide facilities management, they train, and they even lease equipment.

Land of the entrepreneur

The Adapso study also describes the ownership base of the service industry. As might be expected, the majority (62%) of respondees are privately held corporations. Only 13% are public corporations, while most of the remaining are divisions of larger companies (7%), affiliates (5%), or in the proprietorship/partnership category (7%).

(Adapso's survey is distributed by that organization to its members. Copies are also available at $95 each from International Data Corporation, 60 Austin Street, Newtonville, Mass. 02160. IDC prepared the study.)

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GENERAL PURPOSE COMPUTER CENSUS

Counts in the General Purpose Digital Computer (Group A) Census, shown below, are based on the best information available to the International Data Corporation, but are estimates. Computer manufacturers, as a rule, do not directly supply this type of information, and it is only through the use of IDC's extensive data files and other information sources that such estimates are possible. The computers included in Group A comprise the bulk of digital computers (by value) in operation. They are byte or character oriented -- with the exception of large-scale scientific machines -- and are primarily programmed with higher-level languages. In addition to this Census, EDP/IR publishes a Dedicated Application Digital Computer (Group B) Census that includes minicomputers and specialized-purpose machines.

AS OF JULY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Burroughs	205	$ 4,600	1/54	0	5	5	X
	220	$ 14,000	1/58	1	2	3	X
	B-100 Series	$ 3,300	8/64	7	0	7	X
	B-200 Series	$ 6,500	11/61	190	140	330	X
	B-300 Series	$ 8,000	7/65	490	107	597	X
	B-500	$ 4,000	11/68	495	490	985	X
	B-1712	$ 1,950	8/72	-	-	-	NA
	B-1714	$ 2,200	8/72	-	-	-	NA
	B-1726	$ 5,300	2/73	-	-	-	NA
	B-2500	$ 6,800	2/67	280	146	426	35
	B-2700	$ 8,700	8/72	-	-	-	NA
	B-3500	$ 15,500	5/67	565	350	915	85
	B-3700	$ 21,000	11/72	-	-	-	NA
	B-45/4700	$ 29,000	10/71	35	3	38	50
	B-5500	$ 35,000	3/63	115	40	155	X
	B-5700	$ 28,500	12/70	16	3	19	15
	B-65/6700	$ 68,000	11/69	37	43	80	15
	B-7700	$120,000	2/72	1	0	1	6
	Subtotals			2,232	1,329	3,561	206
Control Data Corporation	G-20	$ 19,600	4/61	5	9	14	X
	1604/A/B	$ 42,000	1/60	25	4	29	X
	31/3150	$ 11,000	12/64	81	54	135	X
	3170	$ 17,500	12/70	12	6	18	6
	3200	$ 14,700	5/64	58	51	109	X
	3300	$ 21,500	9/65	118	111	229	15
	3400	$ 23,700	11/64	4	10	14	X
	3500	$ 26,000	1/69	10	15	25	3
	3600	$ 48,000	6/63	21	20	41	X
	3800	$ 53,000	12/65	14	4	18	X
	6200	$ 39,000	11/70	1	3	4	X
	Cyber-72	$ 32,900	10/71	3	6	9	6
	6400	$ 52,000	5/66	58	44	102	X
	Cyber-73	$ 45,000	3/72	3	2	5	6
	6500	$ 68,000	12/67	13	8	21	X
	6600	$115,000	8/64	58	37	95	X
	Cyber-74	$105,000	3/72	1	0	1	5
	6700	$125,000	7/70	3	1	4	X
	7600	$165,000	1/69	12	3	15	X
	Cyber-76	$165,000	3/72	1	0	1	4
	Star-100	$250,000	9/72	-	-	-	2
	Subtotals			501	388	889	47
Digital Equipment Corporation	PDP-6	$ 10,000	10/64	16	9	25	X
	1040/1050	$ 13,300	10/67-12/71	161	69	230	8
	1055	$ 25,000	12/71	18	2	20	12
	1070/1077	$ 34,600	7/72- 9/72	-	-	-	8
	Subtotals			195	80	275	28
Friden	System 10	$ 2,500	10/70	260	90	350	450
Honeywell Information Systems	G-10	$ 2,100	7/64	-	1,050	1,050	X
	G-5X	$ 1,400	1/66	135	1,800	1,935	30
	G-105	$ 1,350	3/69	50	150	200	20
	G-115	$ 2,500	4/66	340	1,200	1,540	X
	G-120/130	$ 4,500	10/69	30	360	390	50
	G-205/215	$ 4,500	9/63	14	0	14	X
	G-210	$ 16,000	3/60	18	0	18	X
	G-225/255	$ 13,000	4/61	132	24	156	X
	G-235/265	$ 17,000	4/64	60	32	92	X
	G-245/275	$ 18,000	2/68	4	3	7	X
	G-405/410	$ 9,000	2/68	28	15	43	X
	G-415/420	$ 14,000	5/64	180	250	430	X
	G-425/430	$ 17,000	6/64	71	104	175	X
	G-435/440	$ 22,000	9/65	55	37	92	X
	G-615	$ 55,000	6/69	14	22	36	X
	G-625	$ 65,000	4/65	1	3	4	X
	G-635	$ 80,000	5/65	55	16	71	X
	G-645	$120,000	7/66	4	0	4	X
	G-6030/40	$ 25,000	6/71	23	22	45	90
	G-6050/60	$ 46,500	7/71	8	5	13	30
	G-6070/80	$ 61,500	7/71	4	3	7	16
	G-Subtotal			1,226	5,096	6,322	236
	H-105	$ 2,100	11/71	110	10	120	100
	H-110	$ 3,200	9/68	180	210	390	X
	H-115	$ 5,300	3/70	860	195	1,055	190
	H-120	$ 5,000	1/66	530	240	770	X
	H-125	$ 7,400	12/67	110	305	415	X
	H-200	$ 7,600	3/64	585	300	885	X
	H-2040	$ 7,500	4/72	30	10	40	85
	H-1015	$ 11,800	4/71	110	32	142	55
	H-2050	$ 12,000	4/72	18	6	24	50
	H-12/1250	$ 12,500	2/66	400	200	600	X
	H-2015	$ 12,800	2/71	140	37	177	65
	H-2060	$ 16,200	4/72	12	4	16	35
	H-2200	$ 19,600	1/66	135	66	201	X
	H-2070	$ 23,000	5/72	6	2	8	16
	H-3200	$ 24,000	2/70	57	24	81	6
	H-4200	$ 31,000	9/68	31	6	37	3
	H-2088	$ 44,000	4/72	1	0	1	8
	H-8200	$ 73,000	2/69	20	4	24	2
	H-4/1400	$ 13,200	12/61	39	34	73	X
	H-800	$ 28,500	12/60	50	14	64	X
	H-1800	$ 46,000	7/64	10	3	13	X
	H-Subtotal			3,434	1,702	5,136	615
	HIS-Subtotal			4,660	6,798	11,458	851

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IBM	System-3/6	$ 1,140	12/70	1,735	1,260	2,995	1,000
	3/10	$ 1,600	1/70	6,525	2,880	9,405	2,800
	360/20	$ 3,700	12/65	7,750	6,600	14,350	X
	360/22	$ 5,600	7/71	900	110	1,010	400
	360/25	$ 8,000	10/68	1,930	1,470	3,400	X
	360/30	$ 11,500	6/65	5,360	3,330	8,690	X
	370/135	$ 14,500	5/72	160	80	240	2,200
	360/40	$ 21,600	5/65	2,880	2,440	5,320	X
	370/145	$ 28,600	7/71	880	320	1,200	1,100
	360/44	$ 14,700	7/66	88	107	195	X
	360/50	$ 36,900	8/65	1,040	730	1,770	X
	370/155	$ 53,000	2/71	865	320	1,185	620
	360/65	$ 72,500	11/65	560	250	810	X
	370/165	$ 89,800	6/71	150	45	195	195
	360/67	$112,000	6/66	61	12	73	X
	360/75	$ 94,000	1/66	41	22	63	X
	360/85	$141,000	10/69	16	6	22	X
	360/9X	$150,000	11/67	15	3	18	X
	360/195	$188,000	3/71	9	1	10	6
	370/195	$192,000	5/73	-	-	-	6
	1130	$ 2,200	2/66	4,000	2,100	6,100	X
	305	$ 3,600	12/57	1	16	17	X
	650	$ 4,800	12/54	4	31	35	X
	1401	$ 6,200	9/60	1,650	2,340	3,990	X
	1401-G	$ 2,300	5/64	210	115	325	X
	1401-H	$ 1,300	6/67	165	42	207	X
	1410	$ 17,000	11/61	137	103	240	X
	1440	$ 4,100	4/63	465	575	1,040	X
	1460	$ 9,800	10/63	74	63	137	X
	1620	$ 4,000	9/60	470	380	850	X
	7010	$ 26,000	10/63	20	14	34	X
	7030	$160,000	5/61	3	1	4	X
	704	$ 32,000	12/55	2	4	6	X
	7040	$ 25,000	6/63	17	23	40	X
	7044	$ 36,500	6/63	15	19	34	X
	705	$ 38,000	1/56	9	5	14	X
	7070-74	$ 27,000	3/60- 2/61	140	58	198	X
	7080	$ 60,000	8/61	54	1	55	X
	7090	$ 63,500	8/60	22	20	42	X
	7094	$ 73,400	9/62	65	11	76	X
	7094-II	$ 79,400	4/64	15	0	15	X
	Subtotal			38,503	25,907	64,410	8,327
NCR	Century-50	$ 1,650	2/71	330	0	330	120
	Century-100	$ 2,600	9/68	1,540	700	2,240	] 150
	Century-101	$ 2,750	10/72	-	-	-	]
	Century-200	$ 7,700	9/69	695	280	975	115
	Century 300	$ 20,000	2/72	3	2	5	45
	304	$ 10,000	1/60	10	1	11	X
	310	$ 1,000	5/61	8	3	11	X
	315	$ 7,000	5/62	360	355	715	X
	315-RMC	$ 9,000	9/65	50	59	109	X
	390	$ 800	5/61	200	195	395	X
	500	$ 1,000	10/65	705	1,635	2,340	X
	Subtotal			3,901	3,230	7,131	430
Philco	1000	$ 7,000	6/63	14	0	14	X
	210/211	$ 40,000	10/58	11	1	12	X
	212	$ 52,000	1/63	6	1	7	X
Standard Computer Corp.	IC-4000	$ 9,000	9/68	3	0	3	X
	IC-6000	$ 16,000	5/67	4	0	4	X
	IC-7000	$ 17,000	6/69	7	0	7	X
Univac	I/II	$ 25,000	3/51-11/57	4	3	7	X
	III	$ 25,400	8/62	42	46	88	X
	SS-80/90	$ 8,000	8/58	39	78	117	X
	418-I/II	$ 13,700	6/63	93	80	173	X
	418-III	$ 19,600	7/69	40	50	90	10
	491/492	$ 27,000	12/61	17	14	31	X
	494	$ 41,400	2/66	51	39	90	X
	1004	$ 1,900	2/63	1,020	1,155	2,175	X
	1005	$ 2,550	4/66	855	210	1,065	X
	1050	$ 8,800	9/63	175	160	335	X
	1103/5	$ 35,000	12/50	4	2	6	X
	1106	$ 40,000	12/69	36	58	94	20
	1107	$ 57,000	10/62	13	16	29	X
	1108	$ 68,000	9/65	132	93	225	X
	1110	$ 79,000	5/72	0	1	1	30
	9200	$ 1,700	6/67	1,595	880	2,475	120
	9300	$ 4,000	9/67	840	840	1,680	85
	9400	$ 10,000	5/69	235	215	450	70
	9700	$ 21,000	8/72	-	-	-	35
	LARC	$135,000	5/60	1	0	1	X
	Subtotal			5,192	3,940	9,132	370
	301	$ 6,600	10/60	235	16	251	X
	501	$ 16,100	6/59	34	2	36	X
	601	$ 40,900	11/62	2	0	2	X
	3301	$ 22,700	7/64	70	0	70	X
	Spectra 70/15	$ 4,000	9/65	18	0	18	X
	Spectra 70/25	$ 7,000	9/65	2	3	5	X
	Spectra 70/35	$ 9,100	1/67	165	6	171	X
	Spectra 70/45	$ 22,100	11/65	360	24	384	X
	Spectra 70/46	$ 37,400	11/68	61	4	65	X
	Spectra 70/55	$ 34,900	11/68	18	2	20	X
	Spectra 70/60	$ 33,400	9/70	18	0	18	X
	Spectra 70/61	$ 47,200	3/71	24	0	24	X
	Spectra 1600	$ 3,600	1/69	55	0	55	6
	Series 70/2	$ 15,400	7/71	90	0	90	45
	Series 70/3	$ 18,900	10/71	9	0	9	7
	Series 70/6	$ 29,300	10/71	22	0	22	16
	Series 70/7	$ 36,300	10/71	10	0	10	8
	Subtotals			1,193	57	1,250	82
	Totals			6,385	3,997	10,382	452
XDS	Sigma-5	$ 11,500	8/67	102	31	133	13
	Sigma-6	$ 20,000	11/70	21	3	24	6
	Sigma-6E	$ 6,100		-	-	-	NA
	Sigma-7	$ 24,000	12/66	90	27	117	5
	Sigma-8	$ 19,000	9/71	3	0	3	6
	Sigma-9	$ 44,000	11/71	6	4	10	7
	940	$ 24,000	4/66	80	3	83	X
	9300	$ 8,500	11/64	30	6	36	X
	Subtotal			332	74	406	37
	TOTALS			57,014	41,895	98,909	10,828

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IBM REALIGNS DATA PROCESSING PRODUCT GROUP

For the second time this year, IBM has made an important organizational change, this time along lines integrating product development with manufacturing. The changes affect only the Data Processing Products Group which, along with the Data Processing Marketing Group, makes up IBM's Data Products Group. The chart below summarizes IBM's organizational structure as it now stands.

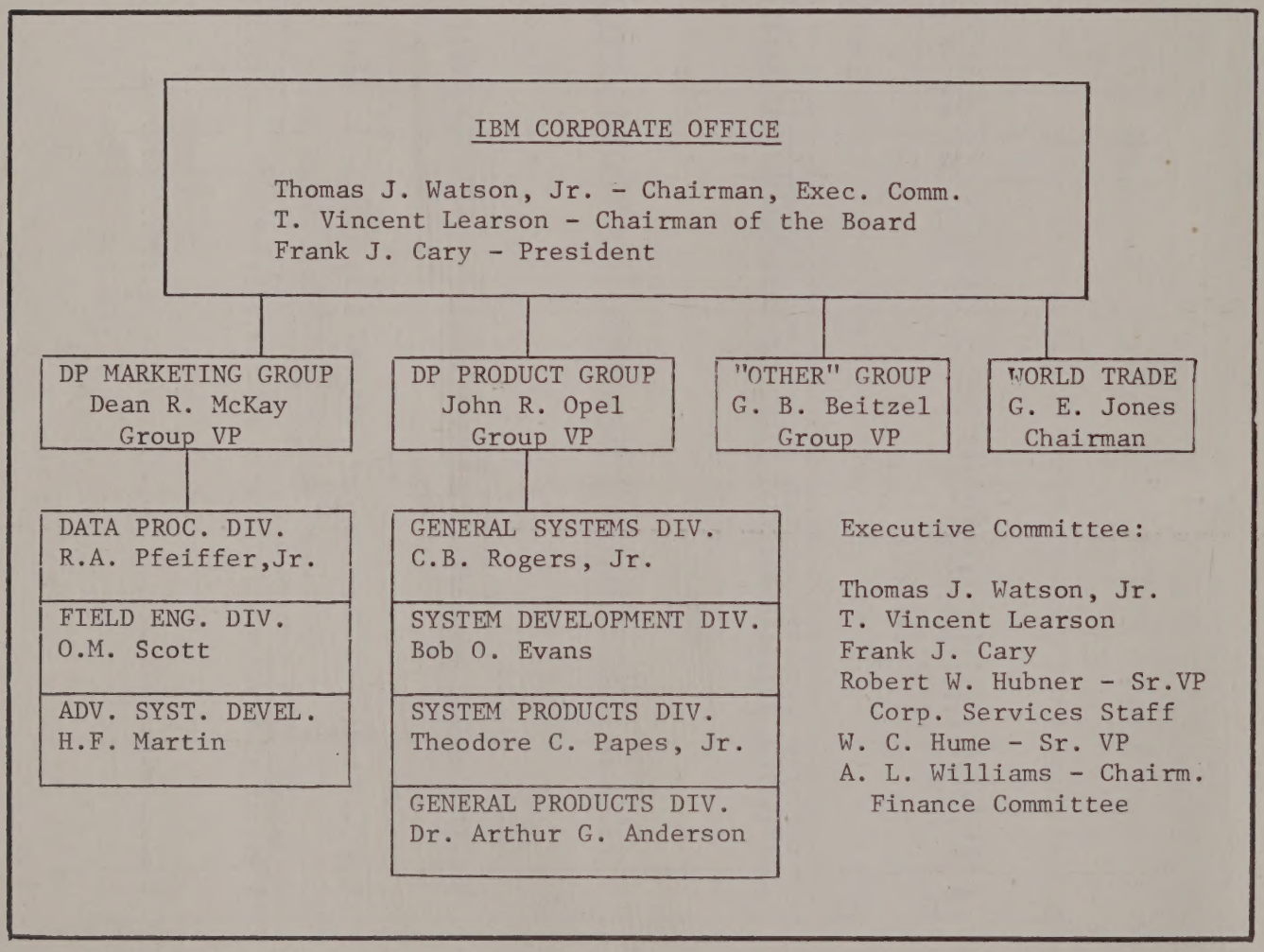
+ The System Development Division is responsible for the systems definition, architecture, and systems management of IBM's principal computer product lines, and for systems programming. It will also develop and manufacture communications gear and terminals.

+ The System Products Division is responsible for the development and manufacture of central processor products.

+ The General Products Division develops and manufactures computer tape units, disk files, and printers.

+ The General Systems Division, which develops and manufactures System/3 and System/7, is left unchanged.

The new divisions replace the former Components, Systems Development, and Systems Manufacturing divisions (EDP/IR Jan.17,1972).



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NOV 6 1972

EDP industry report

• THE INTERNATIONAL DATA CORPORATION'S NEWSLETTER FOR EXECUTIVES CONCERNED WITH THE ELECTRONIC DATA PROCESSING INDUSTRY

"THE GRAY SHEET" OCTOBER 26,1972 • VOL.7,NO.23 P.J.McGOVERN,EDITOR

Justice asks IBM breakup -- page 4

IBM UNVEILS 370/125 FOR 360/20,22,&25 UPGRADES; MACHINE'S DESIGN, PRICE, AND PERFORMANCE PROVIDE MORE QUESTIONS THAN ANSWERS

Every time IBM announces a new model or two for its System/370, the rules seem to change. The only connecting link for this collection of computers seems to be the compatibility of software. That in itself is no small feat, and perhaps is the most important fact about this "series of computers for the 1970s." Family hardware similarities are only skin deep.

First, during what seems like the ancient history of mid-1970, IBM announced the family and two of its members -- the 155 and 165. These looked surprisingly like the 360/85, brought with them a higher capacity disk drive (the 3330), and offered advantages of price/performance, reliability, and communications.

Next came the 145 -- followed by the 135 -- with bipolar semiconductor memory, integrated controllers, and hints of distributed computing. Customers were happy, ordered vast quantities of 370s, and prepared for a quiet period.

SMASH! In mid-1972 (EDP/IR Aug.15,1972) IBM pulled out some more stops. Two new models (the 158 and 168) had Mosfet memories; they and the smaller 370s were designed for virtual storage operation; the real System 370 stood up.

Now, in introducing the long-expected 370/125, IBM has sprung a new design concept -- distributed function asymetric multiprocessing (see page 2). A new approach -- designed from the ground up in Germany -- has been added to IBM's version of computing. And as the implications are evaluated, marketplace impact and unfilled product-line gaps raise many questions.

The 370/125 also illustrates something the Justice Department calls "technological rebundling" in its recent submission of triable issues (page 5): Controllers for most peripherals are replaced by input/output processors; memory is of the Mosfet (semiconductor) variety and comes in only two increments -- 96K and 131K, underlapping exactly the lower portion of the 135's range; only 3330 type disk drives can be used on the system.

The pricetag on the 370/125 is not small. IBM puts rentals in the $8,200- to $13,800 monthly range, and EDP/IR calculates this could be cut 4% to 8% -- to

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IBM INTRODUCES A NEW CONCEPT TO ITS MAINFRAME LINE

The Model 125's central processor consists of a main storage facility surrounded by independent "satellite" subprocessors, all contained within the computer mainframe. These distributed subprocessors, each having its own data storage and logic, provide for independent handling of program instructions, input/output functions, and system diagnostics.

That's how IBM's official press release described the "advanced processor design" of the latest computer to be named into System/370. And the engineering manager for IBM small systems, when asked to explain the above, offered even a more "specific" answer: "It's really a distributed function asymetric multiprocessor." Then, thankfully, he explained the system for EDP/IR.

The system is built around a main storage bus that has its own control unit and allows different types of data flow for different purposes:

- The Instruction Processing Unit (IPU) handles all 370 instructions up to the selection of an I/O device. It has its own 12K Mosfet memory that is expandable to 20K words of 22 bits each. This subprocessor is comparable to the CPU in a System/360, for example.

- A service processor, available for customer engineer access, performs diagnostic routines on the 125.

- One to four input/output processors -- with up to 8K words of memory each -- interface the computer to various I/O units. These are identical in design, but changed for a specific function by the microcode loaded into them and the front-end hardware attached for various peripherals. they substitute for channels and control units on other IBM computers.

As noted, each of the above processors has its own control storage independent of the other processors in the system; each has independent access to main storage. Microcode instructions for each is contained on the diskette (or floppy disk) prepared for the system by IBM. This is loaded into each subprocessor's control storage when the system is powered up.

Tape drives, which weren't designed specifically for the 125, are attached to the bus through their own control units. But other peripherals rely on an input/output processor -- modified by microcode and front-end hardware -- in place of channels and control units. Disk drives (up to four 3330s) require one IOP; a second handles printer and card equipment; a third can support up to 16 start/stop and up to six bisynchronous communications lines, the fourth will serve as a byte multiplexer channel for specialized peripherals such as OCR and MICR.

These IOPs are added within the mainframe cabinet as required, and carry no separate pricetag. But there is an "attachment" charge for use with many peripherals. For disk, only a new 3333 (EDP/IR Aug.15,1972) is needed; it costs about $300 a month more than the original two-spindle version of 3330. Attachment charges for high-capacity card equipment, console printer, and a 1100 lpm printer total $650/mo. And the Integrated Communications Adapter can run from $300 a month for a single bisynchronous line to $1250 for the maximum 22-line configuration. So IOP's really aren't free . . . but they're new.

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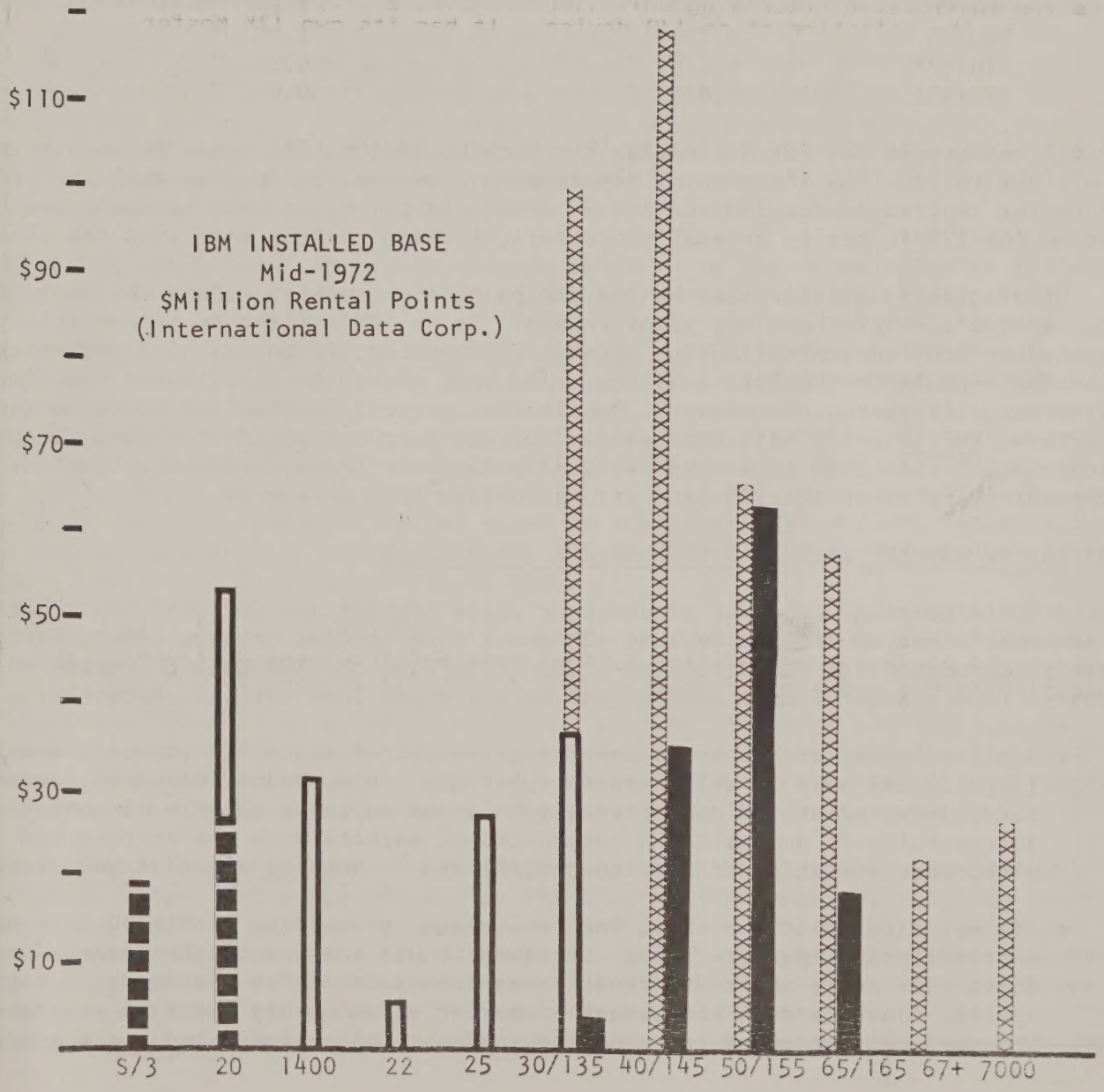
$7,865 minimum, $12,700 maximum -- by a user who opts for Extended Term or Fixed-Term lease options on applicable peripherals. But it's still a far sight from the less-than-$2,000-a-month System/3 or small 360/20. The potential replacement market seems to be large 360/20s, 360/22s, 360/25s, small 360/30s, and 1400s still left from the early 1960s. The total value of this equipment is a healthy $5.75 billion, and some $2.5 billion or so of it could well be replaced by yearend 1974.

The graph below illustrates IBM's installed base as estimated by EDP/IR for mid-1972. Machines represented by unshaded bars are within the size that might be replaced by the 370/125. Typical large 360/20s rent for about $5,000 a month, and the 360/22s and 1400s average about $5,500; so the move to $8,000 or more a month could be significant -- and not be taken -- by quite a few of these users.

Of course, IBM will possibly make a few competitive inroads against smaller computers from Honeywell, NCR, and Univac; also, there is the very real possibility of 125s going into networks centered around giant 370s. But it doesn't look like the upgrade answer for many System/3 users. Something else is likely in the works for the small computer marketplace.



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Big questions

In the chart showing main memory and CPU availability (EDP/IR Aug.15,1972), the 125 looks like an extension of the 360/30 curve, and fits snugly under the start of the 135 line. Since the computer is designed for virtual storage operation, there's little chance of its memory capacity being reduced below the 96K (plus peripheral processor capacity) level; on the upside, there would seem to be no reason why memory couldn't go as high as the 135 (245K). And there's a real pricing quirk involved.

Although the memory and CPU are priced together for each of these models, we performed the rather common calculation of subtracting the cost of the smallest and largest memory sizes available, dividing out, and coming up with an implied cost for CPU and Memory increment on the two machines. It presents a question.

Model	Implied Processor Rental	Incremental Memory Cost
360/25	$ 430/month	$3.27/byte
360/30	1,123 "	1.89 "
360/40	2,291 "	1.38 "
370/125	4,175 "	0.30 "
370/135	3,870 "	0.90 "

That's why people say IBM is loading the machine in the CPU, where independents can't get to it. The incremental memory cost, however, is in line with the price of Mosfet implied in the 158 and 168 -- about 25¢ per byte; and the basic processor on the 125 is really several processors, perhaps costing more than the 135.

Other questions are raised by the design of the computer. Does the fact of the machine's origin have any significance? It is IBM's first to be completely managed -- from conceptualization through engineering, financial, and marketing planning -- outside the United States. And what about the distributed function asymetric multiprocessor concept? Despite the general "ho-hum" attitude in many quarters, EDP/IR can't help but believe the new computer could be a clue to the direction of things to come. We eventually expect a "nameplate generation" of computers, and maybe the 125 is a strong move in this direction.

JUSTICE DEPARTMENT SAYS IT WILL PUSH FOR IBM BREAKUP

After an incubation period of almost four years (EDP/IR Jan.28,1969), the Justice Department's antitrust case against IBM seems to be taking on some form. Early this year Judge David N. Edelstein -- who officiated the IBM Consent Decree of 1956 -- took charge of the case and got both parties into motion. Recently:

- Justice, under orders to do something, presented tentative triable issues (page 5) and says it will push to split IBM "into several discrete, separate, independent and competitively balanced entities capable of competing successfully in domestic and international markets with one another and with other domestic and foreign competitors." Nothing specific was stated.

- IBM moved to split the trial into two parts, proceeding within 30 days on a definition of markets case. It wants to use results of the "census" conducted for other major antitrust cases consolidated for discovery in Minneapolis. Justice says the issues of market and monopoly can't be separated. The motion is expected to be denied, and a trial at least two years away.

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TENTATIVE TRIABLE ISSUES

The Justice Department, in a document filed October 13, says that "additional discovery and further discussions with the defendant [IBM]. . . may result not only in the restatement of these issues, but also in the appropriate headings under which they should be listed." But, it goes on to say, these represent the basic skeleton of the triable issues in this case. EDP/IR below list the headings and primary issues raised:

"Market measurement" -- Did the way IBM itself measured markets before the Complaint, or does the way it measures them now provide an adequate measurement method? Did IBM change its market measurement policies and practices on or about the time of the filing, and if so do these changes show that IBM knew its prior practices revealed monopoly? Does the Justice evidence of intent to monopolize establish a market and/or IBM's share in any relevant market or markets? What about the market "statistics routinely collected and disseminated by industry experts?" Is any one or more of the following a relevant measure of markets?

a) Dollar value of shipments of new products;
b) Unit volume of shipments of new products;
c) Installed inventory of products manufactured by each company;
d) "Net position" (a term used by IBM to measure products on order plus installed products minus products that are going to be removed) of products manufactured by each company;
e) Revenue obtained from the sale or lease of the products.

In using one or more of the above measurements, is the lease price equivalent and/or the purchase price equivalent the appropriate indices of value?

"Market structure and indicia of monopoly power" -- Does IBM's share of relevant markets characterize them as monopolized markets? Does the high/sustained level of profitability by IBM during a period of substantial growth -- accompanied by the exit of two of the leading industrial enterprises in the U.S., GE and RCA -- characterize the markets as monopolized? Are there barriers to entry by new competitors? Barriers to expansion by existing competitors? Does the enormous market power of IBM consitute a barrier that contributes to sustained monopolization? Does power in one market result in part from power in closely related markets?

What about IBM's ability to price products substantially higher than the comparable products of competitors? IBM's ability to establish product standards unilaterally? What about IBM's size -- both absolute and relative to its competitors -- in terms of revenues, profits, research and development expenditures, total assets, accumulated liquid assets, number of employees, etc.? Does potential competition from whatever source constitute an effective deterrent to IBM's exercise of its monopoly power in relevant markets?

"Intent to monopolize" -- Did IBM intend to monopolize relevant markets? Is this intent evidenced in part by IBM's marketing practices relating to pricing, leasing, product announcements and product developments, customer or supplier relations and educational allowances? Do statements by IBM officials or employees -- including those in IBM documents -- evidence IBM's intent to maintain its monopoly position in relevant markets?

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"Bundling" -- Did IBM engage in "bundling," -- marketing a combination of computer products and services for a single price -- to discourage or forestall the growth or entry of competitors? Did bundling give IBM greater control? Discriminate among customers? Help out in prestige accounts? Inhibit the growth of independent competitors? Keep any companies from entering or expanding in relevant markets? What about:

a) IBM's post-Complaint announcements of changes in its product lines, marketing policies, and prices?
b) IBM's June 1971, Fixed Term Plan announcement;
c) IBM's August 1971, Extended Term Plan announcement;
d) IBM's technological rebundling in its recent announcements with respect to memory units, file adapters, and selector channels of 370 Series.

"Fighting machines" -- Did IBM announce and introduce selected computer products with unusually low profit expectations? What about products IBM believed that it was unlikely to be able to produce and market within the announced time frame? What about products announced primarily to discourage customers from acquiring products being marketed by competitors? In particular, what about IBM's announcement of System/360 of April 7, 1964 "when, in fact, such products were not tested or announced in conformance with IBM's established procedures . . . " Did IBM misrepresent to customers the characteristics, delivery dates, capabilities, and/or specifications of new or modified computer products to hinder competition?

"Leasing" -- Did IBM do any of the following to encourage customers to lease from IBM, to create a lease-oriented environment and thereby raise the barriers to entry or expansion, or to discourage the entry or expansion of computer leasing companies:

a) Manipulate the relationship between lease and purchase price to discourage purchase?
b) Discriminate against subsequent users by denying customer support, engineering, and maintenance services provided to first users?
c) Deny or threaten to deny maintenance to customers for non-IBM memory units with an IBM central processing unit?
d) Announce and offer long-term leases at substantial discounts with substantial penalties for premature termination?
e) Set salesmen compensation policies that encouraged lease rather than sales?
f) Refuse to lease add-on equipment to customer with purchased products?

"Education allowances" -- Did IBM restrain competitors from entering, remaining, or expanding certain markets by granting exception discriminatory allowances and other considerations to educational and scientific institutions, as well as other prestige accounts, for the purpose of:

a) Maintaining IBM computer installations at prestige accounts, and
b) Insuring familiarity among graduates of educational institutions.

Did these practices not only exclude competitors from the accounts, but also have ultimate impact on the purchasing decisions? Were all of these done pursuant to and in furtherance of its attempt to monopolize and the monopolization of the relevant market or markets herein?

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ACM GROUP DISCUSSES IBM'S ROLE -- PAST AND FUTURE; SUGGESTS INDUSTRY PARTICIPATION IN SHAPING A SETTLEMENT

The San Fernando Valley Chapter of the Association for Computing Machinery (ACM) couldn't have planned its October meeting better if it had used an authentic crystal ball. The program subject: "Is IBM Bad for the Computer Industry?" The timing, set far in advance: Just days after Justice spelled out the current status of its case (see page 4). The protagonists: Dan McGurk, former president of Xerox Data Systems and currently making news as president of the Computer Industry Association; Frank Wagner, executive vice president of Informatics; and Robert Patrick, billed as the "world's most independent consultant," to serve as advocate for IBM.

Following is a report on the meeting from IDC's West Coast representative, John Rehfeld. It's a fairly comprehensive summary of various viewpoints heard throughout the industry, and serves as a good starting point for discussion.

Setting the stage

IBM can be examined from many points of view: As the company sees itself; as it is seen by other mainframe manufacturers; as looked at by the independent peripheral manufacturers; as seen by the user; and through the eyes of the stockholder. It should be noted that IBM has more than half a million stockholders, and the value of its stock on Wall Street is greater than that of General Motors plus American Telephone & Telegraph.

Also, the panelists emphasized, the very nature of IBM is subject to interpretation. In a real sense, IBM has many characteristics of a bank -- a very large bank -- with cash resources itemized at nearly $2 billion at yearend 1971. This is a powerful asset to be wielded as marketplace conditions change. And don't forget about IBM's $750 million favorable balance of trade, the panel reminded attendees.

Furthermore, IBM's stature in the computer industry must be remembered. For one thing, the company has created about the only standardization that exists in the computer industry, particularly in software, albeit on IBM terms. But if the industry Giant were broken up, some force would have to fill the gap.

Possibilities for action

What about remedies to IBM's dominant stance in the computer industry? Three suggestions, one of them somewhat novel, were offered:

- Break it up. (Agreement on this suggestion ends with its proposal, however. Most of the alternatives that seem at all operable wind up appeasing only some of the factions while working to the further detriment of others.)

- Negotiate another consent decree. This is the most expected outcome of the suit brought by Justice. Most expect it would follow a pattern similar to the 1956 Decree . . . and produce similar problems.

- Establish a regulatory agency, by act of Congress, that would provide continual enforcement much as the Federal Communications Commission tries to keep a watch on AT&T's role in telecommunications.

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Two other concepts, definitely worth consideration it seems to EDP/IR came out of the meeting. First, there was strong expression that members of the computer industry -- "not a bunch of economists and lawyers in Washington" -- should have the say about what happens. To emphasize and publize this, McGurk has been holding meetings across the country.

Second, there was the general agreement that, up until the current time, at least, IBM is the greatest thing that ever happened to the computer industry. Indeed, it made the business, providing leadership during the dynamic and "technological phase" of the industry's growth. The problem is the future. IBM, the panelists say, has begun to act contrary to the best interests of users -- "raising mainframe prices simply to lower peripheral prices," for example, in a direct attack on independent manufacturers. And if the company continues to go unfettered, it will begin to behave more and more like a traditional monopoly of the type that the Sherman Act was passed to prevent.

Continuing in this vein, one of the attendees suggested a look into the future. "Let's not talk about the computer business that we know . . . the business IBM has saturated already. Let's talk about breaking up IBM where its growth is. Break out the System/3 group and make it a separate company, since small computers are becoming very important. Break out and restrain IBM's Office Products Division, since the digitized electronic office will be important in the future. IBM should be broken up with a view to where the growth will be in the next 10 years rather than in reaction to what happened in the last 10. Make its telecommunications operations a separate company."

Additional comment centered on IBM's role as a multinational corporation, a prime contributor to a positive balance of trade. Several suggestions were made in this direction, and one common thread was that IBM should be restrained heavily in this country but left more or less on its own in international commerce. This seems to be somewhat shortsighted, however, since most U.S. companies today see the world as their oyster.

Food for thought

EDP/IR thinks there is much merit in the suggestion about looking to the future. Indeed, it is one of the first times the computer industry has had a chance to take a lesson from the past, and Judge Edelstein is in a perfect position to do this.

The 1956 Consent Decree -- worked out between IBM and the Government under Judge Edelstein's jurisdiction -- mentioned electronic data processing, but it was initiated to correct problems in the EAM or punched card area. In retrospect, the Decree reads as if the existence of computers was thrown in as an afterthought. Yet it determined IBM's course in the computer industry.

Today, many changes and new growth areas are in the wings of the computer industry. As EDP/IR has pointed out in the past, things seem to be moving toward the formation of an information processing industry involving such concepts as distributed computing, word processing, and perhaps a whole collection of terminal-type products that could be called information appliances. There is room for competition in these areas, and it is important that the industry framework for the future is suitable for the development of these new industries. We continue to favor conditions that will stimulate future growth and competition; we join the ACM panelists in urging understanding in any settlements.

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POINT-OF-SALE TERMINAL SUPPLIERS JOCKEY FOR POSITION AS MARKET APPROACHES $60 MILLION TO $70 MILLION ANNUAL LEVEL

Quite a few people these days are registering mild shock when they go to a department store, make a selection, proceed to a sales counter, and suddenly realize that what used to be a simple cash register is now a computer terminal . . . a terminal (perhaps with an unfamiliar nameplate) that is quickly and quietly acknowledging the purchase -- and perhaps the availability of credit as well -- as the sales clerk more speedily than ever "rings" up the sale and wraps the purchase.

Situations like the above, however, are happening more and more often. Just a dream for most people even a year or so ago (EDP/IR June 30,1971), electronic point-of-sale (POS) systems are popping up all around. And as market leaders begin to emerge, the dozen or so suppliers are jockeying for position. Signs of consolidation have also appeared.

- Just last week, Singer -- already holding an estimated 60% of the market ("More than all the others put together" a company spokesman told EDP Industry Report during a recent meeting of the National Retail Merchants Association.) in department or general merchandise stores -- announced it has agreed to acquire Nuclear Data Inc.'s Electronic Store Information Systems division which has installed over 500 POS terminals in supermarkets.

- NCR -- with the most to lose in POS because of its 70% hold on the mechanical cash register market -- is picking up steam with its 280 retail terminal system. Announcements have been coming out regularly, and what may be the biggest yet was the disclosure last week of an agreement with Federated Department Stores. While pointing out that Burdine's -- with eight stores in the Miami area -- will be installing NCR 280 retail terminals and associated equipment over the next several months, NCR stressed that Federated's fold includes other famous retail names like Abraham & Straus, Bloomingdale's, Bullock's, Filene's, and Sanger-Harris.

- Pitney Bowes-Alpex announced in August that shipments of its Spice (Sales-Point-Information-Computing-Equipment) systems exceeded the $1 million level in July. As October ended, it announced it had installed over 2,000 Spice systems in over 100 retail outlets, and implied deliveries at about the 100-per-month rate.

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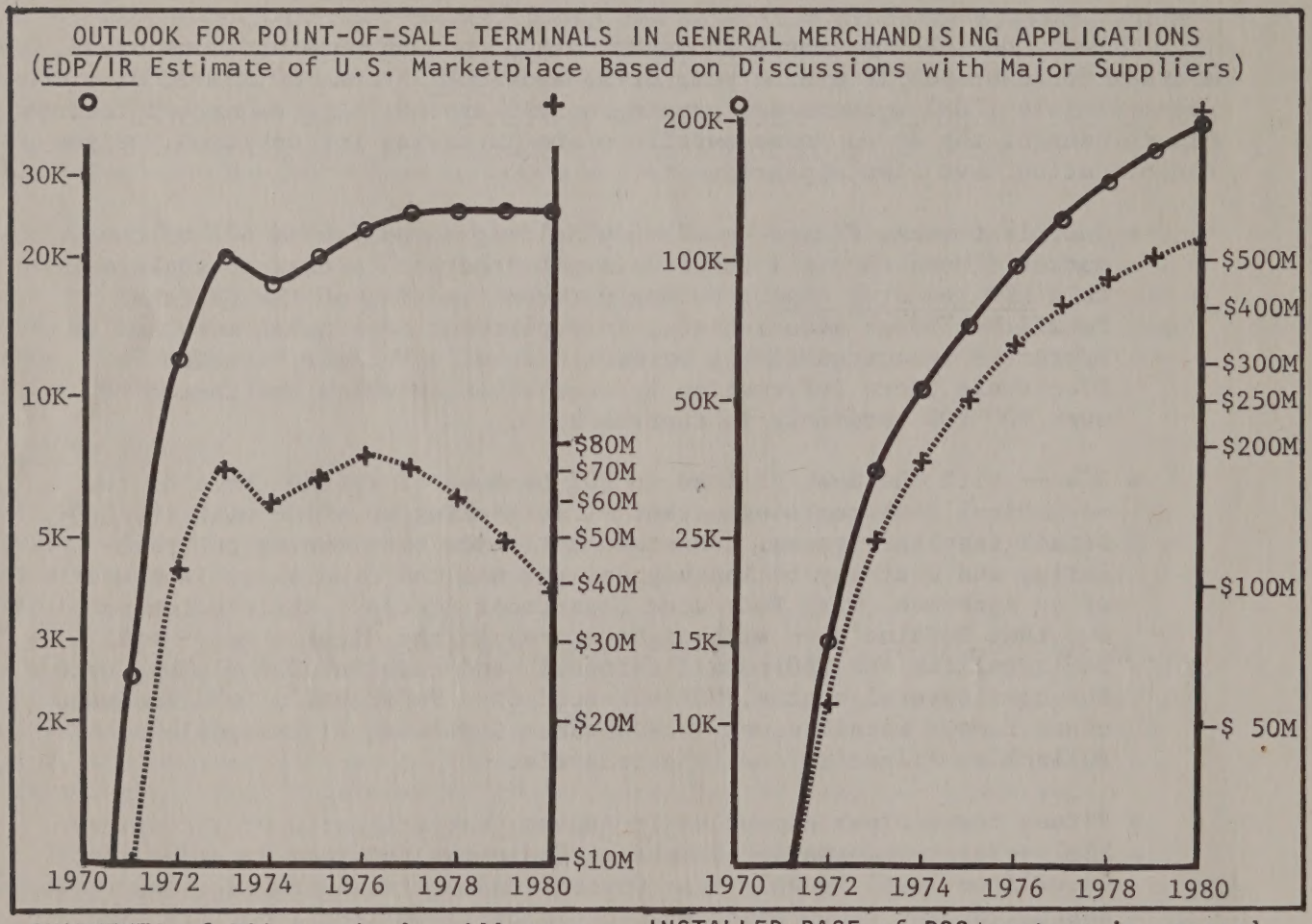
It's very important for suppliers to latch onto the big chains that are left. Sears, Roebuck already has a five-year agreement with Singer, and Montgomery Ward has NCR as prime supplier. So the Federated order is a crucial test for NCR, since it will present an interesting case study. Bloomingdale's served as one of PB-A's pilot installations two years ago, and may serve as an indication of local autonomy vs. chain-wide compatibility . . . and a prime test of NCR against PB-A.

First of the information appliances?

POS terminals, as suggested earlier, are the first contact for most of the public -- and those serving it -- with computers. And the tremendous surge in installations (to 35,000 in general merchandise stores by yearend 1973, as shown below, and to a similar level in supermarkets) will quickly give a reading on how people react to a computer in their life. So far, reaction has been good.

POS terminals, it seems to EDP/IR, represent a type of product that will be introduced in increasing variations. We call it the information appliance . . . a special-purpose computer terminal that accomplishes old or new tasks at little or no extra cost and that brings to the user the benefits of distributed computing. This is not the first example: Airlines reservations terminals, stock quo-



SHIPMENTS of POS terminals will zoom to the 20,000 annual level next year, then hold steady in the $60 million to $70 million range as demand parallels that for cash registers

INSTALLED BASE of POS systems in general merchandising should climb steadily to about 200,000 by 1980. Value will grow slightly slower as average price drops down from today's $3,500 level

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tation devices, automatic ticketing equipment have led the way. The POS terminal is a significant departure from these, however.

- Physically and functionally it resembles its predecessor (cash register);
- It was designed for, not adapted to its application;
- It requires very little training for use, and no knowledge of the complicated system to which it interconnects.

The market for such products -- for some time, at least -- is for replacement, and continued growth on the part of a supplier requires a steady stream of new products as older ones quickly reach the initial saturation level and then continue only along the previous demand curves. These products, as one NMRA speaker described the electronic cash register in Miami, produce "bulges on a flat curve." So during the next few months, EDP/IR will be examining various types of information appliances, the industries they serve, and their marketplace acceptance.

What makes a good POS terminal?

At the Information Systems and Telecommunications Conference held by the NMRA, many of the speakers were from accounting and other consulting organizations. One session featured Harry Schreiber of Peat, Marwick & Mitchell and Richard Fleischer of Fenvessy Associates, specialists in POS. In discussing the economic impact of POS, Schreiber pointed out the desirable characteristics of a POS terminal:

> The optimum POS terminal provides internal programability, a tutorial keyboard, performs calculations and extensions, handles credit authorization, does check-digit verification, requires digit entry enforcement, captures data, has communications ability and automatic code reading ability. In addition, it performs all traditional cash register functions.

Such a terminal used in a general merchandise store brings two types of immediate savings. (The hardware cost is more or less a washout in new construction, with POS possibly costing a fraction more than conventional systems.) First, there are people savings in clerical, accounting, and purchasing operations; these plus the increased speed with handling customers can amount to a very conservatively estimated $44,000 per 100,000 employee hours in a stores total operation. In addition, there are savings in cash register shortages (from automatic cash accounting and change computation) that are slightly higher than people savings.

The really big benefits of POS, however, show up in merchandise management . . . the make or break talent of retailers. Systems implemented to accommodate POS (or to include it!) provide accurate and immediate data capture, automatic replenishment, and reduced levels of inventory investment. For these reasons, and others, Fleischer's assessment seem to summarize the current situation: "POS will be necessary to survive in the 1970s."

Growth of POS . . . and problems

By the end of 1973, POS will be a fait accompli in general merchandise retailing and not far behind in supermarkets, discount stores, and the like. And today's hardware offerings are certainly up to the job. In addition to NCR and Pitney Bowes-Alpex out there trying to knock off Singer's early lead, eight to ten other companies are already operating from reasonable footholds.

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Americal Regitel got its start with the Bullock's stores in California, and is the only major supplier that currently offers credit-checking hardware in addition to a POS terminal. Sweda, a division of Litton Industries, operates from the second largest cash register base (15% of the world's installations) and reports orders for thousands of systems. Olivetti, with some showcase installations abroad, is making a pitch for its share of the U.S. market. Uni-Tote division of General Instrument Corp. has several thousand electromechanical POS stations, and sees good prospects for its electronic cash register with its hard-wired controller (rather than the usual minicomputer). Documentor Sciences, Information Machines Corp., Ricca Data Systems, and Transaction Systems are entries.

The problems facing POS hardware suppliers as a group are peripheral to the products themselves, but key to retailers putting in new systems. They evolve around two specifics: Credit authorization and standardization of marking for automatic label reading.

On the credit front, most retailers and POS suppliers have left this to companies in that business, requiring only that hardware manufacturers make provision in their product and wiring requirements for the inclusion of both store-wide and centralized credit checking. Many of them currently or plan to work with bank card systems or some of the established credit services such as TRW, Credit Systems Inc., Digital Data Systems, or National Data. Already, some 60,000 or more "terminals" (usually telephones or touch-tone pads) are checking credit.

A solution to standardization will be coming shortly. Today, the retail industry is using 10-digit Store Keeping Units (SKUs) for merchandise marking, and by next spring its committee is to decide among several types of optical codes. Readers for several different systems are already manufactured and used by some retailers today, and most suppliers say that adapting to the standard will present little problem . . . even if it means purchase or cross-license. The "wand" that can be swept across a tag or credit card by the cashier seems most likely to come into common use once the marking system is established.

What lies ahead

Need among retailers is great, as shown by the attendance at the meeting in Miami. In addition to the real benefits, there is the pressure to "keep up with the Jonses." But in retailing, this is more than status. When one major store installs POS with credit checking, its losses drop quite low -- and those in nearby stores seem to increase -- until all stores in an area have their own version.

And there's plenty of help for the retailers. Only 47% of the attendees at the Miami conference were users. About one-third were equipment suppliers, and another 13% of the participants were consultants of one type or another. The final 8% of the audience, as might be expected, was from IBM. A few of these people may have been there to help their customers as the story went, but most were from development labs and application programming departments. Some people expected an IBM product announcement at the meet, and there is certainly reason to continue wondering where and how IBM will make its presence known.

If POS -- as EDP/IR believes -- is the first of many markets that will gradually move computer capability into the world of the consumer . . . if POS is the first true example of the information appliance . . . can IBM's product entries be far away? Is it an artistic coincidence that a special-purpose terminal was chosen as the cover for IBM's 1972 annual report? EDP/IR thinks not.

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Balancing time and service demands

GE, TYMSHARE BROADEN SCOPE OF THEIR COMPUTER SERVICE OFFERINGS

Two of the leading computer service suppliers -- GE's Information Services Business Division and Tymshare, Inc. -- have announced extensions to their service offerings during the past month or so. The two announcements don't look at all alike on the surface, but each is obviously aimed at leveling out the daily peaks and valleys that occur with localized interactive service suppliers; in different ways, each company is following what seems to be a natural path (EDP/IR Sept.15, 1972) in the evolution of the computer service industry.

- In a "compatible upgrade" of its prior Mark II service system, GE has introduced Mark III, a full-line computer service that offers batch, remote-batch, or rair service to customers.

- Following the lead of a few other service suppliers, Tymshare has installed a dedicated high-capacity telecommunications link between its New York and Paris offices, thus forming a network that stretches nearly halfway around the world.

Both these moves are attempts to keep central computer equipment running around the clock, thereby maximizing revenue -- and customer service -- possible from a given level of central processor investment.

Tymshare's geographical expansion certainly isn't a new idea . . . for the industry or the company. GE and UCC demstrated the feasibility of cable or satellite teleprocessing back in the 1960s, and Tymshare has been connecting its service offerings eastward ever since its start on the West Coast. Through lines emanating from its Paris center, Tymshare will provide much of Western Europe access to a system that has a nine-hour differential. Thus, Europeans can work -- and pay Tymshare -- while Westerners sleep.

GE's new service really means the addition of remote-batch processing, or "background mode." Users request such runs from their interactive terminals, which trigger a Honeywell 6070 computer (with the Gecos-III operating system) to call a high-speed terminal such as the IBM 2780 or Data 100. GE says it soon will offer a wider range of central computer equipment for such interconnection.

In addition, Mark III brings a "foreground mode," or rair processing with a few more features than offered under Mark II. For instance:

+ A budget control system allocates and admisinters computing costs and makes daily reports to the user, broken down as required.

+ Improved cryptographics bring tighter security for user files.

+ A "duty section" to provide around-the-clock customer service.

The cost of rair services in Mark III is the same as it was in Mark II. For remote-batch service, the customer pays according to his chosen priority: 15 minutes, three hours, or one day. GE says its customers can cut their monthly charges in half by operating with a slight remote-batch delay rather than on-line, and it points out that many jobs run better this way. And another service balancing move will be coming soon -- GE will be opening service to the Far East.

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DEDICATED APPLICATION DIGITAL CON COMPUTER CENSUS

The following data about Dedicated Application (Group B) computers is based on the best information available to the International Data Corporation, and much of it has been verified by the manufacturers. Comments or corrections should be directed to the attention of EDP/IR's census editor, Walter E. Misdom.

Group B computers, as defined by IDC, include those commonly called mini-computers and certain larger systems usually designed or used for one application, such as process control, data acquisition, or the like. These computers are word oriented (most commonly 8, 12, or 16 bits per word), usually purchased, and predominantly programmed in assembly language or Fortran. They are categorized as:

Price Class 1 -- less than $25,000 average system price;
Price Class 2 -- $25,001 to $50,000 average system price;
Price Class 3 -- $50,001 to $100,000 average system price;
Price Class 4 -- more than $100,000 average system price.

AS OF JULY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	NOTES	BITS PER WORD	PRICE CLASS	PURCHASE PRICE ($1,000) BASIC	AVERAGE	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
Apeco	80/20		8	2	29	35	6/70	10+	0	10+	NA
(Cascade Data)	80/30		8	2	32	40	1/70	25+	0	25+	NA
	80		16				1/70			NA	NA
Autonetics	Recomp-II		40	4	95	127	11/58	20	5	25	X
	Recomp-III		40	3	65	94	6/61	7	2	9	X
Bailey Meter	750		25	4		110	6/60	37	15	52	X
	755		25	4	80	330	11/61	7	0	7	X
	756		25	4	90	150	2/65	15	12	27	X
	855/15		16	2	24	135	12/72	-	-	-	NA
	855/25		25	4	100	400	4/68	16	0	16	X
	855/50			4		400	3/72	2	0	2	10
Bunker Ramo	130		15	3		90	10/61	160	27	187	X
	133		15	4		108	5/64	79	9	88	X
	230		15	4		134	8/63	15	2	17	X
	300		29	4		275	3/59	18	5	23	X
	330		29	4		275	12/60	19	5	24	X
	340		29	4		375	12/63	19	3	22	X
	1018		18	1		23	6/71	NA	NA	NA	NA
Cincinnati Milacron	CIP/2X00	a	8/9	1	4	12	7/69	NA	0	NA	NA
	CIP/4000		18	3		53	4/71	NA	0	NA	NA
Clary Datacomp	404		16	1	6	25	10/69	100	20	120+	NA
Collins Radio	8311			1	15	17	1/68	NA	NA	NA	NA
	8400			4		950	11/62	25	5	30	X
	8500		32	4	200	1000	1/67	53	16	69	X
Compiler Systems, Inc.	CSI-16		16	2	11	20	11/70	20+	0	20+	80
	CSI-24		24	3	15	30	12/70	NA	0	NA	30
Computer Automation Inc.	108/208/808		8	1	5	11	4/68	275	25	300	NA
	116		16	1	8	16	8/70	50	0	50	NA
	216		16	1	8	20	7/69	300	30	330	NA
	816		16	1	10	15	12/68	40	5	45	X
	Alpha-8		8	1	3	4	12/71	]	]	]	NA
	Alpha-16		16	1	4	9	10/71	] 270	] 30	] 300	NA
	Naked Mini-8		8	1	2		5/72	-	-	-	
	Naked Mini-16		16	1	3		10/71	125	0	125	NA
	Subtotal							1,060	90	1,150	NA
Computer Development	CD-2000		8	1	7	10	8/70	NA	0	NA	NA
Computer Logic Systems	CLS-18		18	1	9	14	3/71	NA	0	NA	NA
Computer Signal Processors	CSP-30		16	4	85	120	6/70	10+	0	10+	NA
Comten Inc.	10			1		17	7/69	35+	0	35+	NA
	20		16+2	3		75	3/71	75	0	75+	NA
	40		32+4	4	125	240	8/69	22+	0	22+	NA
	60		32+4	4	150	285	6/69	18+	0	18+	NA
Control Data Corp.	160		12	4	60	112	5/60	49	11	60	X
	160-A		12	4	90	225	7/61	200	65	265	X
	160-G		13	4		535	3/64	35	0	35	X
	924/A		24	4		430	8/61	26	1	27	X
	1700		16+2	4	37	160	3/66	358	97	455	X
	1700-SC		16+2	3	20	60	9/70	105	50	155	NA
	8090		12	3		96	5/64	116	89	205	X
	8092		8	3		67	6/64	56	14	70	X
	G-15		29	3		61	7/55	265	18	283	X
	LGP-21		32	2		42	12/62	140	13	153	X
	LGP-30		32	3	49	59	8/56	290	43	333	X
	RPC-4000		32	4	87	101	10/60	61	12	73	X
	CSC-46		21	4		250	/54	10	0	10	X
	CSC-136		25	4		275	/60	4	1	5	X
	CSC-636		15	4		300	10/63	13	2	15	X
	Elbit-100		12	1	6	8	6/67	5	445	450	X
	M-1000		24	4	250	365	/68	20+	0	20+	NA
	Subtotal							1,753	861	2,614	NA
Datacraft	6024-1		24	4	32	100	5/69	16	0	16	2
	6024-3		24	3	32	75	2/70	94	13	107	53
	6024-5		24	1	11	27	5/72	2	0	2	35
Data General Corp.	Nova		16	1	8	11	2/69	865	110	975	NA
	Nova-800		16	1	7	10	3/71	170	10	180	NA
	Nova-1200		16	1	5	9	12/70	1,235	135	1,370	NA
	Supernova		16	1	10	14	5/70	215	25	240	NA
	Supernova-SC		16	1	14	19	6/71	40	5	45	NA
	Subtotals							2,525	285	2,810	
Datamate Computer Systems	DM-16		16	2	17	26	11/69	12	0	12	X
	DM-70		16	1	9	15	12/70	20+	0	20+	NA
	DM-70/ROM		16	1	4	6	10/70	NA	0	NA	NA
	ECP-18		18	1	14	15	11/66	21	0	21	X
	2400		24+3	1	15						
Data Technology	1600		8	1	6	22	9/68				
Digiac Corp.	3060			1	9	13	1/70	78	0	78	8
	3080		25	1	20	25	12/64	16	0	16	X
	3080-C		25	2	26	37	10/67	8	0	8	X
Digital Computer Controls	D-112		12	1	4	10	8/70	496	87	583	NA
	D-116		16	1	4	10	1/72	69	2	71	125
	D-216		16	1	8	16	8/71	130	20	150	NA
Digital Computer Systems	System 32		32	3	60						

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Digital Equipment Corp.	PDP-1		18	4	120	136	11/60	37	4	41	X
	PDP-4		18	3		74	8/62	30	3	33	X
	PDP-5		12	2	30	36	9/63	62	29	91	X
	PDP-7		18	3		66	11/64	68	26	94	X
	PDP-8		12	2	18	30	5/65	950	450	1,400	X
	PDP-8/E		12	1	5	12	4/71	3,145	840	3,985	1,300
	PDP-8/F		12	1	4		5/72	2	0	2	100
	PDP-8/I		12	2	13	28	3/68	2,265	860	3,125	X
	PDP-8/L		12	1	8	21	10/68	3,090	610	3,700	X
	PDP-8/M		12	1	4		1/72	330	35	365	100
	PDP-8/S		12	1	10	20	9/66	715	205	920	X
	PDP-8/Linc		12	2	38	48	9/66	82	52	134	X
	PDP-9		18	2	35	50	12/66	295	140	435	X
	PDP-9/L		18	2	20	33	11/68	34	14	48	X
	PDP-11/3,5,15		16	1	4	10	4/71	900	0	900	]
	PDP-11/20		16	2	9	28	3/70	1,600	600	2,200	] 1,200
	PDP-11/45		16	2	15	50	?	-	-	-	]
	PDP-12		12	2	13	45	4/69	462	153	615	20
	PDP-15		18	3	15	75	2/70	379	156	535	20
	Subtotal							14,446	4,177	18,623	2,740
Digital Scientific Corp.	Meta-4		16	3	21	60	4/70	65	0	65	NA
Dynamic Research	DRC-44		24	2		36	7/68				
Electronic Associates Inc.	640		16	2	27	55	6/67	107	60	167	4
	1020		16	1	20	25	2/64	100	25	125	X
	8400		32	4	200	450	6/65	19	6	25	X
	Pacer-100		16	2	15	17	5/72	-	-	-	NA
Electronic Processors	EPI-118		18	1	6	14	3/71	NA	NA	NA	NA
EMR Computer	210		21	4	94	132	4/62	9	0	9	X
	420		42	4	324	450	6/63	3	0	3	X
	2100		21	4	65	143	12/63	8	0	8	X
	6020		24	4	72	176	4/65	15	2	17	X
	6040		24	4	98	224	7/65	10	1	11	X
	6050		24	4	123	360	2/66	19	6	25	X
	6070		24	4	240	600	10/65	1	2	3	X
	6120		16	1	8	16	7/70	NA	NA	NA	NA
	6130/6135		18	4	85	200	6/67	64	12	76	X
	6140		16	4	60		11/72	0	0	0	NA
	6145		16	4	135		7/72	-	-	-	NA
Foto Mem, Inc.	Centauer-100		8	1	6	20	4/70	18+	0	18+	X
Four Phase Systems	IV/70		24	2	16	60	3/71	200	0	200	NA
Foxboro Co.	Fox-1		24	4	95	260	10/72	-	-	-	NA
	Fox-2		16	2	21		9/72	-	-	-	NA
	2/10		16	3	50		10/72	-	-	-	NA
	2/30		16	4	80		10/72	-	-	-	NA
General Automation Inc.	GA-18/30		16+2	2	18	50	7/69	135	20	155	NA
	SPC-12		8	1	4	16	1/68	1,005	120	1,125	NA
	SPC-16		16	1	8	25	5/70	360	40	400	NA
GE/PAC	30	b	8	1	7	25	5/69	125	15	140	NA
	312		20	4		200	3/60	27	6	33	X
	412		20	4		300	7/62	39	8	47	X
	3010	c	16	3	13	90	5/70	24	4	28	
	3010/2	d	16	4	30	140	12/71	NA	NA	NA	
	4010		24	4	76	200	10/70	38	5	43	NA
	4020		24	4	79	240	2/67	215	70	285	NA
	4040		24	4		120	8/64	45	20	65	X
	4050		24	4		280	12/66	23	2	25	X
	4060		24	4		340	6/65	18	2	20	X
	4070		24	4	300	1500		-	-	-	NA
	Subtotal							554	132	686	NA
GRI Computer Corp.	909		16	1	4	9	1/70	210	40	250	50
GTE/Tempo	II		16	1	6		1/72	10	0	10	NA
	1		16	1	14	36	12/69	90+	10	100+	NA
Hewlett Packard Co.	2000-A	e	16	4	89	101	11/68	156	65	221	X
	2000-B	f	16	4	119	134	8/70	10	2	12	X
	2000-C		16	4	187	205	3/71	12	2	14+	NA
	2000-E		17	3	50		7/72	-	-	-	NA
	2000-F			4	110		7/72	-	-	-	NA
	2005-A	g	16	3	72	85	6/69	26	6	32	X
	2007-A	h	16	1	20	20	9/68	43	11	54	X
	2100-A		16	2	7	35	9/71	450	50	500	NA
	2114-A		16	1	10	16	10/68	409	109	518	X
	2114-B		16	1	9	15	11/69	525	140	665	NA
	2115-A		16	2	15	26	11/67	267	65	332	X
	2116-A		16	2	22	32	11/66	88	17	105	X
	2116-B		16	2	24	40	9/68	650	162	812	X
	2116-C		16	2	20	45	11/69	390	40	430	NA
	3000		16	4	100	170	9/72	-	-	-	NA
	Others							260	45	305	NA
	Subtotal							3,286	714	4,000	NA
Honeywell	19		19	4		140	5/61	3	0	3	X
	21		20	3		63	2/66	41	25	66	X
	24		24	4		200	5/63	82	3	85	X
	112		12	1	5	10	11/69	190	40	230	NA
	116		16	3		65	4/68	172	35	207	X
	124		24	4	65	130	3/66	109	18	127	X
	224		24	4	75	380	3/65	55	8	63	X
	290		18	4		175	11/60	10	2	12	X
	316		16	2	8	45	6/69	1,120	380	1,500	NA
	324		24	4		250	7/68	12	0	12	X
	416		16	2	17	43	4/67	198	130	328	X
	516		16	3	24	95	10/66	760	240	1,000	X
	632		32	4	97	450	12/68	10	4	14	X
	700 Series		16+1	3	19	53	6/72	-	-	-	NA
	1642	i	16	4	144		4/71	NA		NA	NA
	1644	i	16	4	192		4/71	NA		NA	NA
	1646	i	16	4	240		4/71	NA		NA	NA
	1648/A		16	4	375	440	12/69	18	5	23	X
	Subtotal							2,780	890	3,670	NA

Notes:

a. 2000 and 2100 cross-licensed version of Microdata - 800
b. cross-licensed version of Interdata - 1
c. cross-licensed version of Interdata - 4
d. cross-licensed version of Interdata - 70
e. utilizes 2116-B
f. utilizes 2114-B or 2116-B
g. utilizes 2116-B (RTES)
h. utilizes 2115-A or B (Educ. Basic System)
i. utilizes two 316's
j. cross-licensed version of Data General - Nova
k. Mnfr. by Photo Inc.
l. utilizes XDS-Sigma 2
m. utilizes CAI-116

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AS OF JULY 1, 1972

NAME OF MANUFACTURER	COMPUTER MODEL	NOTES	BITS PER WORD	PRICE CLASS	PURCHASE PRICE ($1,000) BASIC	AVERAGE	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS IN U.S.	NUMBER OF INSTALLATIONS OUTSIDE U.S.	TOTAL NUMBER OF INSTALLATIONS	TOTAL NUMBER UNFILLED ORDERS
IBM	1710/1720		6	4		225	2/62	13	17	30	X
	1800		16+2	4	47	235	2/66	675	400	1,075	X
	System/7		16	3	17	55	9/71	680	120	800	1,200
	Subtotal							1,368	537	1,905	1,200
Imlac	PDS-1		16	1	10	11	2/70	NA		NA	NA
Information Technology, Inc.	4900/5		8	1	3	5	10/70	NA		NA	NA
	4900/10		16	1	10	20	10/65	25	0	25	X
	4900/20		12/32	2	30	50	10/69	10+	0	10+	X
Infotronics	Mini/Max		16	1		25	7/70				
Interdata	1		8	1	4	11	12/70	175	70	245	100
	2		16	1	9	11	7/68	20	0	20	X
	3		16	1	13	20	5/67	200	0	200	X
	4		16	1	17	21	8/68	270	115	385	40
	5		16	1	11	25	11/70	70	20	90	X
	15		16	2	22	35	1/69	40	24	64	X
	16/18		16				5/71	3	11	14	X
	50 (Comm)		16+1	1	7	23	5/72	3	1	4	15
	55 (Comm)		16+1	2	16	40	7/72	-	-	-	NA
	70		16	1	7	50	9/71	130	15	145	110
	74		16	4			2/73	-	-	-	NA
	80		16	2	15		9/72	-	-	-	NA
	Subtotal							911	256	1,167	NA
Interplex	System-1		16	2	47	47	9/70	NA	NA	NA	NA
Lockheed Electronics	MAC-16		16	1	12	22	3/69	280	30	310	NA
	MAC-Jr		16	1	8	16	11/70	575	65	640	NA
	Sue-1100		16	1	4	8	2/72	25	0	25	NA
Microdata Corp.	400		8	1	3	4	1/70	100	0	100	NA
	800		8+1	1	5	8	1/69	450	100	550	NA
	810		8	1	6	10	5/69	310	90	400	NA
	812		8	1	11	15	12/69	225	65	290	NA
	820		8	1	6	13	10/70	310	90	400	NA
	1600		16	1	5	11	2/72	90	10	100	NA
	Subtotal							1,485	355	1,840	
Mini Comp	MD-708		8	1	5	7	8/70	25+		25+	NA
	Administrator-2		16	3	35	52	12/70	NA		NA	NA
	Multi User-E		16	3	67	85	11/70	NA		NA	NA
	Multi User-I		16	3	40	58	1/71	NA		NA	NA
Modular Computer Systems	Modcomp-I		16	1	5		10/71	50	0	50	300
	Modcomp-II		16	2	10	27	3/71	15	0	15	
	Modcomp-III		16+2	3	14	65	12/70	50	0	50	
Mohawk (Atron)	501		8	2	8	35	9/69	140	15	155	NA
Monitor Data	MD/708		8	1	3		8/70				
Motorola Comm. Div.	MDP-1000		8	1	8	19	2/69	50+	0	50+	NA
Nuclear Data, Inc.	ND-812		12	1	7	15	3/71	200	0	200	NA
Omnicomp Computer Corp.	Omnus-1		16	1	7	12	8/71	NA	0	NA	NA
Omnitec (BIT)	480		8	1	6	17	12/66	195	3	198	X
	483		8	1	9	33	1/70	100+	35+	135+	NA
Qantel Corp.	Qantel-V		8	2	14	26	6/70	125	0	125	NA
Raytheon Data Systems	703		16	1	13	23	10/67	220	40	260	X
	704		16	1	10	18	4/70	185	65	250	NA
	706		16+2	2	19	30	5/69	95	25	120	NA
	PB-250		22	2	33	48	12/60	155	20	175	X
	PB-440		24	4		140	3/64	18	2	20	X
	PB-520		24	4		128	10/65	26	1	27	X
	Subtotal							699	153	852	NA
Redcor Corp.	RC-70		16+2	2	15	30	7/68	125	15	140	X
Rolm Corp.	1601	j	16	2	13	28	3/70	65	10	75	NA
Sanders	Series 800		16				12/71				
	Sandac-200		16+2	3		60	3/69				
Scientific Control Corp. (Consultronics)	600 Series		24	3	31	80	10/65	230	0	230	X
	4700		16	3	15	50	4/69	18	0	18	X
	DCT-132		8	2	28	30	5/69	35	85	120	X
Spear	Microlinc		12	3	46	57	6/66	33	3	36	X
Spiras Systems/USM	65		16	2	19	40	8/69	25	0	25	NA
Sys. Computer Corp.	500		8				6/72	-	-	-	NA
	1000		8	1	4		1/71	300	0	300	NA
	1500		8				6/72	-	-	-	NA
Systems Eng. Labs	810		16	2	38	45	9/65	24	0	24	X
	810-A		16	2	18	90	4/67	236	10	246	X
	810-B		18	4	30	150	12/68	95	5	100	X
	840		24	3	65	80	11/65	3	0	3	X
	840-A		24	3	60	75	8/66	36	2	38	X
	840-MP		26	4	49	260	12/67	33	0	33	X
	71		16	2	15	48	8/72	-	-	-	NA
	72		16	2	20	45	9/71	12	3	15	NA
	85		32	4	150	240	7/72	-	-	-	NA
	86		32	4	200	325	6/70	24	1	25	NA
	88		32	4	350	600	3/71	1+	0	1	NA
Tenet	210		32	4		280	8/71				
Texas Instruments	960		18	2	14	30	6/70	20+	0	20+	NA
	960-A		17	1	3		11/71	NA			NA
	980		16	2	17	40	5/68	100+	0	100+	NA
	980-A		16	1	4						
Unicom, Inc.	CP-8A		8	1	3		2/70	67	7	74	NA
	CP-8B		8	1	3		3/70	47	5	52	NA
	CP-8C		8	1	5		3/70	86	9	95	NA
	CP-8D		8	1	7		4/70	12	0	12	NA
Unicomp, Inc.	Comp-16		16	2	11	29	6/70	21	0	21	NA
	Comp-18		18	2	12	38	8/70	30	0	30	NA
Varian	73		16	2	10	36	9/72	-	-	-	NA
	520/i		16	1	6	13	9/68	300	140	440	X
	610		12	1		15	7/64	10	0	10	X
	620		16	2		37	11/65	75	0	75	X
	620/i		18	1	10	20	6/67	1,600	85	1,685	X
	620/f		16	1	11	25	11/70	170	30	200	10
	620/1		16	1	5	12	4/71	350	85	435	125
	R620/i		18	2	14	28	7/68	75	5	80	NA
	R622/i		18	2	15	30	7/68	90+	10	100	NA
	Subtotal							2,670	355	3,025	NA
Varisystems	PAC-16	k	16	1	4		9/69	20+	0	20	NA
Wang Labs, Inc.	3300		8	2	14	40	4/71	45+	0	45	NA
Westinghouse Electric Corp.	P-50		14	1	16	23	8/64	203	19	222	X
	P-250	l	16	3	40	62	9/67	58	10	68	X
	P-510		18	4	85	110	6/63	21	2	23	X
	P-550		18	4	85	110	6/63	9	4	13	X
	P-580		18	4	85	110	6/63	9	0	9	X
	P-2000		16	2	10	27	8/69	138	34	172	NA
	2500		16	2	10	30	11/71	46	5	51	NA
	Subtotal							484	74	558	NA
Xerox	92		12	3		90	4/65	42	8	50	X
	910		24	4		120	8/62	168	15	183	X
	920		24	4		150	9/62	111	19	130	X
	925		24	4		200	12/64	13	2	15	X
	930		24	4	80	400	6/64	112	18	130	X
	CE-16		16	1	8	18	6/69	17+	0	17	NA
	CE-16/A		16	1	15	25	12/69	50+	0	50	NA
	CF-16/A	m	16	1	8	17	11/70	35	0	35	NA
	Sigma-2		16	4	24	125	12/66	210	40	250	X
	Sigma-3		17	4	28	140	1/70	140+	40	180	NA
	Subtotal							898	142	1,040	NA
	TOTALS							42,744	9,916	52,660	

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